

PLANNING THE DEVELOPMENT OF  
LIVING PLANT COLLECTIONS  
IN BOTANICAL GARDENS AND ARBORETUMS

by

Jane Guest Pepper

A thesis submitted to the Faculty of the University of Delaware  
in partial fulfillment of the requirements of the Longwood Program  
for the degree of Master of Science in Ornamental Horticulture.

Copyright Jane Guest Pepper

June, 1978

## ACKNOWLEDGEMENTS

I wish to extend sincere thanks to the Longwood Foundation for providing the financial support to make this study possible. Grateful thanks go also to those who have served on my thesis committee. Each committee member played a special role: Dr. Richard W. Lighty has given me continual support and encouragement during two years of research and writing; Dr. Edward P. Alexander, Department of Museum Studies, has given excellent editorial advice which enabled me to polish my initial rough drafts; and Mr. Joseph Oppe, Director of the Arthur Hoyt Scott Horticultural Foundation, not only encouraged me to base some of my studies on the Foundation collections, but also provided many helpful suggestions as these studies progressed. Other staff members at the Foundation, notably Mr. David Melrose, Ms. Judith Zuk, and Mr. Harry Foulke were most helpful with Chapter IV. Without Ms. Betsy Evans, who typed the final manuscript, and Mr. Forrest Brainerd who acted as proof-reader, I could never have finished the project, and had it not been for the warm understanding, patience, and encouragement of my husband, Wing Pepper, I would never have applied to the Longwood Program, never mind completed this thesis.

## TABLE OF CONTENTS

ACKNOWLEDGEMENTS . . . . .	iii
TABLE OF CONTENTS . . . . .	iv
LIST OF TABLES . . . . .	ix
ABSTRACT . . . . .	x
INTRODUCTION. . . . .	1
Chapter	
I. RATIONALE IN FAVOR OF CAREFUL PLANNING FOR THE DEVELOPMENT OF PLANT COLLECTIONS IN BOTANICAL GARDENS AND ARBORETUMS . . . . .	4
Introduction . . . . .	4
Coping with Scarcity of Land . . . . .	6
Financial Accountability . . . . .	6
Avoiding Poor Documentation, Maintenance and Display . . . . .	8
The Need for a Baseline . . . . .	16
Protecting the Long-Term Interests of the Garden . . . . .	23
Evaluating Staff Accessions and Donations from Outside Groups . . . . .	25
Promoting National/International Co-operative Efforts . . . . .	25
Bibliographical Notes . . . . .	27
II. COLLECTION POLICIES CURRENTLY OPERATING IN SELECTED BOTANICAL GARDENS AND ARBORETUMS. . . . .	29
Introduction . . . . .	29
Findings from Personal Communications with Garden Personnel Regarding Collection Policies . . . . .	32

Royal Botanic Garden, Edinburgh . . . . .	32
Fairchild Tropical Gardens . . . . .	36
County of Los Angeles, Department of Arboreta and Botanic Gardens . . . . .	40
The University of Michigan, Matthaei Botanical Gardens . . . . .	43
University of Wisconsin Arboretum, G. William Longenecker Horticultural Gardens . . . . .	45
Royal Botanic Gardens, Kew. . . . .	46
Findings from Correspondence with American Gardens . . . . .	48
Bowman's Hill State Wildflower Preserve University Botanical Gardens at Asheville, North Carolina . . . . .	49
Missouri Botanical Gardens . . . . .	49
Huntington Botanical Gardens. . . . .	50
Waimea Arboretum . . . . .	51
Findings from Correspondence with Gardens Overseas . . . . .	53
National Botanical Gardens of South Africa . . . . .	53
Bibliographical Notes . . . . .	55

### III. COLLECTION POLICIES IN MUSEUMS AND LIBRARIES 57

Introduction . . . . .	57
Collection Policies for Museums . . . . .	58
Delaware Art Museum . . . . .	59
Seattle Art Museum . . . . .	61
Field Museum of Natural History . . . . .	62
Library Collections . . . . .	65
Pennsylvania Horticultural Society Library . . . . .	67
Bibliographical Notes . . . . .	69

IV. DEVELOPING A COLLECTIONS POLICY . . . . .	70
Introduction . . . . .	70
General Guidelines for Developing Garden Collection Policies . . . . .	70
Development of a Policy for the Living Plant Collections at the Arthur Hoyt Scott Horticultural Foundation, Swarthmore College, Pennsylvania . . . . .	74
Original purposes . . . . .	74
Present-day role . . . . .	75
History of collection development . . . . .	76
General evaluation of present collections General evaluation of strengths of collections in nearby gardens . . . . .	77
Future directions (classification) . . . . .	82
Future directions (decisions) . . . . .	85
Implementation of the Plan for the Living Collections at the Scott Horticultural Foundation . . . . .	91
Accessions policy . . . . .	93
Noting reasons for accessions . . . . .	95
Implementation of Collection Policies by Other Gardens . . . . .	95
Board involvement . . . . .	96
Keeping a policy viable . . . . .	96
Bibliographical Notes . . . . .	97
V. COLLECTION EVALUATION . . . . .	98
Introduction . . . . .	98
Evaluation of Selected Taxa at the Foundation . . . . .	100
<u>Cornus florida</u> . . . . .	101
<u>Malus</u> (flowering crabapples) . . . . .	104
Outline of evaluation process . . . . .	104
Summary of results of flowering crab- apple evaluation . . . . .	112
<u>Magnolia</u> . . . . .	113
Bibliographical Notes . . . . .	117
CONCLUSION. . . . .	119

## APPENDICES

1.	Arthur Hoyt Scott Horticultural Foundation, Swarthmore College, Pennsylvania. Detailed Maintenance Figures. December 1, 1976 - November 30, 1977 . . . . .	121
2.	John J. Tyler Arboretum, Lima, Pennsylvania. Detailed Maintenance Figures. January 1, 1977 - December 30, 1977 . . . . .	124
3.	The Use of Record Systems in the Planning of Botanic Garden Collections . . . . .	127
4.	Royal Botanic Garden, Edinburgh. Present and Desired Generic Representation in Living Plant Collections . . . . .	142
5.	Fairchild Tropical Gardens, Coral Gables, Florida. Criteria for Making Plant Accessions, Essentially Perennial Ornamental and Botanical Species at the Fairchild Tropical Gardens . . . . .	150
6.	Fairchild Tropical Gardens, Coral Gables, Florida. Categories of Plants Being Grown in Rare Plant House and Their Records . . . . .	152
7.	County of Los Angeles, Department of Arboreta and Botanic Gardens, Arcadia, California. Plant- Introduction Program. January 1, 1971 . . . . .	157
8.	County of Los Angeles, Department of Arboreta and Botanic Gardens, Arcadia, California. Procedures on Acquisitioning, Accessioning and Record Keeping, Plant- Introduction Program. January 1, 1971 . . . . .	162
9.	County of Los Angeles, Department of Arboreta and Botanic Gardens, Arcadia, California. Plant Collections Program. A Supplement to the Plant-Introduction Program. June 1, 1977. . . . .	166

10.	The University of Michigan, Matthaei Botanical Gardens. Policy on Collections of the Botanical Gardens . . . . .	170
11.	Delaware Art Museum, Wilmington, Delaware. Policy Recommendations by the Accessions Committee . . . . .	173
12.	Seattle Art Museum Accessions Policy . . . . .	178
13.	Arthur Hoyt Scott Horticultural Foundation. Categorization of Families and Genera . . . . .	184
14.	Arthur Hoyt Scott Horticultural Foundation. Taxa Proposed for Street Tree Collection . . . . .	188
15.	Flowering Crabapples - Evaluation Criteria . . . . .	190

# LIST OF TABLES

## Table

1.	Arthur Hoyt Scott Horticultural Foundation, Swarthmore, Pennsylvania. Selected Maintenance Figures. December 1, 1976 - November 30, 1977 . . . . .	12
2.	John J. Tyler Arboretum, Lima, Pennsylvania. Selected Maintenance Figures. January 1, 1977 - December 30, 1977 . . . . .	13
3.	University of Guelph Arboretum, Guelph, Ontario. Master Plan, Native Tree Collection . . . . .	19
4.	University of Guelph Arboretum, Guelph, Ontario. Master Plan, Birch and Alder Collection . . . . .	20
5.	University of Guelph Arboretum, Guelph, Ontario. Master Plan, Fall Colour Collection . . . . .	21
6.	Arthur Hoyt Scott Horticultural Foundation. <u>Cornus florida</u> Evaluation . . . . .	102
7.	Arthur Hoyt Scott Horticultural Foundation. <u>Malus</u> (flowering crabapples) Evaluation . . . . .	106
8.	Arthur Hoyt Scott Horticultural Foundation. Recommended Selections of Flowering Crabapples. . . . .	110
9.	Arthur Hoyt Scott Horticultural Foundation. <u>Magnolia</u> Evaluation . . . . .	114



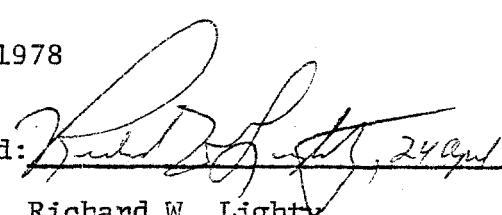
PLANNING THE DEVELOPMENT OF  
LIVING PLANT COLLECTIONS  
IN BOTANICAL GARDENS AND ARBORETUMS

by

Jane Guest Pepper

An abstract of a thesis submitted to the Faculty of the  
University of Delaware in partial fulfillment of the requirements  
of the Longwood Program for the degree of Master of Science in  
Ornamental Horticulture.

June, 1978

Approved:  24 April 1978

Richard W. Lighty  
Professor in charge of thesis

ABSTRACT

If botanical gardens and arboretums are to be successful in serving their constituents in future decades, the directors, curators and administrators of these gardens must critically examine the purposes, programs and living plant collections of their individual institutions. No longer can they afford to collect plants at random. But how do they restrict themselves to accessioning only those plants relevant to their purposes and programs?

The author considers both the theoretical and the practical aspects of planning living plant collection development. Examples are given of current planning methods used by personnel in selected botanical gardens and arboretums in North America and overseas, and in selected American museums and libraries. In Chapter IV, following some basic guidelines for developing a policy for the living plant collections in any garden, the author explains the process followed in establishing guidelines for such a policy at the Arthur Hoyt Scott Horticultural Foundation, Swarthmore College, Swarthmore, Pennsylvania. The final Chapter contains details of the preliminary work done on the evaluation of the present plant collections at the Scott Horticultural Foundation.

## INTRODUCTION

Throughout history men and women have assembled collections -- collections of furniture, paintings, books and manuscripts, even beer cans, bottle tops and matchboxes. In the fields of botany and horticulture, botanists, horticulturists and amateur gardeners have assembled collections of living plants, many of which are now housed in botanical gardens and arboretums.

When walking through some of these gardens the visitor can detect a strong sense of purpose behind the development of the plant collections. In others the purpose of the collections is obscured by the desires of garden personnel both past and present either to collect everything they came across, or to collect only the groups of plants in which they had or have a strong interest. This collecting instinct is to some extent present in many human beings. Some collect in order to amass riches, some for reasons of prestige, some to answer specific scientific questions, and others because their curiosity leads them in a certain direction.

It would be hard to justify most living plant collections (except possibly during the "Tulipomania" of the seventeenth century) on the basis of attempts to amass riches because, as the plant collector knows, not only is the initial value of the plant often small, but the cost for its upkeep in years to come will be large. Thus we must seek reasons other than financial gain for assembling living plant collections. In public gardens the given reasons for assembling living plant collections vary, but these reasons would, in most cases, fit into one or several of the following general categories: display, education, research and conservation. Ideally the plant collections in any individual garden should reflect a purposeful balance among these functions as determined by the objectives of the garden. In gardens where the living plant collections do not reflect these objectives I suggest this is due to one or a combination of several situations: garden personnel have never established a clearly defined policy or plan regarding the development of the living plant collections; such a policy was established at one time but has since languished in a dusty file cabinet unknown to recently-arrived or lower-level staff members; or, the policy is around and staff members are aware of it, but it is never discussed, rarely enforced and is in dire need of revision.

Any one of the above situations can lead to plant collections which appear to have been gathered at random, rather

than having been consciously selected to fulfill a specific purpose.

Chapter I of this thesis will consider the reasons for careful development of a firm statement regarding the living plant collections in every garden (In order to avoid repetition I shall in future refer to any such statement as a "policy"). In Chapter II I will give examples of collection policies that exist in botanical gardens and arboretums in America, Canada, Great Britain and South Africa. Chapter III will cover findings on selected museums and libraries which face collection problems similar to those of botanical gardens and arboretums.

In Chapter IV, following some basic guidelines for developing a policy for the living plant collections in any institution, I will explain the process followed in developing such a policy for the Arthur Hoyt Scott Horticultural Foundation, Swarthmore College, Pennsylvania. The final Chapter will contain the details of the preliminary work done on the evaluation of the present collections at the Scott Horticultural Foundation.

## CHAPTER I

### RATIONALE IN FAVOR OF CAREFUL PLANNING FOR THE DEVELOPMENT OF PLANT COLLECTIONS IN BOTANICAL GARDENS AND ARBORETUMS

#### Introduction

Definitions for the words "arboretum" and "botanic garden" abound and I have no intention of adding a new one to the list. For the purposes of this study, the word "garden" will describe

an educational institution for scientific and practical research in horticulture, forestry, agriculture and botany particularly in the culture, reproduction and retention of all or selected plant species and cultivars adapted to the social and economic needs of the region; and to improve the knowledge and appreciation of woody and herbaceous plants and to affect an increase in their use. <sup>8</sup>

"Plant collection" is another term in need of clarification. First, I am considering only living plant collections.

This thesis is not concerned with herbarium collections. Secondly, when I mention the living plant collections of an institution I am referring to the whole group of plants being grown in that garden. Other terms for "collections" might be "holdings" or "inventories." The use of the word "collection" in the singular would indicate a particular collection, such as a viburnum collection, or a collection of flowering trees.

When I began to study this problem of careful planning for the development of plant collections it soon became evident that there were almost as many different attitudes towards the situation as there were different gardens. These attitudes ranged from the careful control at Fairchild Tropical Gardens, Coral Gables, Florida to that of the Director of a twelve-acre garden who, when asked how he selected the plants to be included in the garden under his direction, said: "Oh, we want everything. Well, there are a few trees we cannot hope to accommodate....."

This latter attitude is, I consider, potentially damaging to the future of all botanical gardens. Below I shall present seven main arguments in favor of careful planning for development of plant collections.

I. Coping with Scarcity of Land

In the days of rapidly increasing land values and greater competition for open space we must ask ourselves if our living plant collections are really indispensable. When laid against hospitals or fire houses they probably are not, but how about the value of a garden vs. a basketball field, or a new highway? These are questions garden personnel will be asked to answer in the up-coming years and I see our cases being very flimsy unless we can show that the plant collections which occupy the disputed land are vitally necessary to carry out the stated purpose of a particular garden. With increased interest in open spaces for aesthetic and ecological reasons it may be relatively simple to prove the case that the land should be held open. But can we really prove that we need the plant collections for research or for education?

II. Financial Accountability

In the never-ending struggle to find additional monies to support their institutions, garden administrators are watching with interest the newly-established Institute of Museum Services (IMS). For the fiscal year starting October 1, 1978, IMS will award grants to museums from its initial appropriation



of \$4 million. Botanical gardens and arboretums are included in the definition of "museums" and may therefore apply for support under these appropriations. Since grant categories are likely to include general operational support, administrators will probably look to IMS for assistance in caring for living plant collections.<sup>1</sup>

It is doubtful, however, if money will be forthcoming from this source unless administrators can provide IMS with satisfactory answers to questions of the following nature:

- what were the original purposes behind the development of these collections?
- have the collections developed along the originally-conceived lines?
- how do you use these collections in your current programs?
- what are the future directions for your collections?

The past development of a particular living collection will be of interest to the Institute in an historical sense. Future plans for the collections will probably have direct influence on IMS funding decisions. A garden that has analyzed the content of its living collections, assessed the strengths and weaknesses, and set clear directives for future evaluation and accessioning would be in a better position to qualify for support than the garden with a vague reference to the purpose and future

plans for the living collections.

The importance of financial accountability in gardens is neither new nor only applicable in the U.S.A. P.A. Thompson, Royal Botanic Gardens, Kew, Surrey, England wrote in Taxon in 1971 that

Economically one must expect that more and more attention will be paid to the effectiveness of an organization before funds are made available for its maintenance and development, and that institutions which have poorly defined or apparently feeble roles will suffer severely from financial stringency. 13

### III. Avoiding Poor Documentation, Maintenance and Display

Every plant accessioned into a garden must be considered as a long-term proposition. Who is going to accession, plant and maintain this organism? Without a well-considered plan for the development of living collections, plants are piled into a garden until every nook and cranny is filled. Generally the results of such excesses are:

#### 1. Poor Documentation

Good plant documentation and labelling are two basic principles which distinguish a botanic garden or arboretum from a public park. In one new, small garden I visited, the collecting impulse had taken over and the "records" consisted of leather-bound volumes stashed in the back of the greenhouse. Mildew had already rendered some pages almost unreadable. In

contrast to this situation is the magnificent recording operation at the Rancho Santa Ana Botanic Garden in Claremont, California. In A Summary of the Culture of California Plants at the Rancho Santa Ana Botanic Garden 1927-1950, Percy C.

Everett notes the importance of having "adequate and accurate records upon which to evaluate the work in progress, that which has been completed, and for planning future operations." <sup>6</sup>

This early attention to developing a workable records system has made it possible for the staff of Rancho Santa Ana to keep detailed records on each collection as it enters the Garden, the method by which it is propagated, and its progress as seen by a staff member during the annual inventory of all Bed Plantings. (Some groupings - called Cover Plantings -- are inventoried less frequently.)

From the very beginning Rancho Santa Ana had a clearly-defined purpose - the collection of plants native to California - which immediately narrowed the range of plants acceptable in the Garden. Today they still collect only native California plants.

Good plant documentation has two phases. First, the initial recording of information known about the plant as it enters the garden. The accuracy of this information is vital,

because as George Bunting and Freek Vrugtman point out:

Many collections are created and maintained especially to serve plant scientists - horticulturists, botanists and foresters - and they are utilized also by entomologists, plant pathologists, geneticists, and others. For the scientific usage, the origin of a specimen is an essential datum.<sup>2</sup>

The source of a large number of plants is not the only mystery in many living plant collections. Frequently, trees and shrubs with inaccurate or incomplete names are accessioned, labeled and planted, and become part of a garden's permanent plant collection.

To accession a plant is obviously expensive, and the only available information on exactly how expensive comes from the University of British Columbia Botanical Garden. Here they

estimate nearly \$6.50 for every collection that goes into our Garden components. The cost involves staff time, the time involved in obtaining the plant, and placing the plant into the Garden area.<sup>12</sup>

The second phase involved in good plant documentation is monitoring the plant's progress. Many gardens are stuffed with "interesting" plants which are seldom looked at critically. In other situations, such as the Rancho Santa Ana Botanic Garden, the annual inventory of all Bed Plantings ensures that a plant will be evaluated as to height, spread, condition and other details once a year, and once every five years after the first ten years. These inventories are time-consuming and therefore

expensive. John Dourley, Superintendent of Rancho Santa Ana, used to estimate three weeks each spring to cover their Bed Plantings, containing approximately 16,000 plants and covering approximately 56 acres. In 1977 because of the increased age of many plantings and an improved system, the inventory took only five days.<sup>5</sup> However, the Garden can justify expending time and money to record information on plants that have a definite reason for being in the Garden. In a garden with a poorly-defined collections policy there is little reason or incentive to record information on plants that serve no real purpose.

## 2. Poor Maintenance

The most expensive long-term aspect of developing a plant collection is obviously the maintenance of these plants. In an attempt to be more specific as to exactly how expensive collection maintenance is I asked Mr. Harry Foulke, Grounds Foreman, Arthur Hoyt Scott Horticultural Foundation, Swarthmore College, and Mr. Joe Bowers, Grounds Foreman at the John J. Tyler Arboretum, Lima, Pennsylvania to keep records on the maintenance of specific collections under their direction for one year. Tables 1 and 2 show the annual totals for each collection. Monthly breakdowns are included in Appendices 1 and 2. Wide variation in maintenance costs for similar plant materials might be attributed to different levels of maintenance, different densities, companion plants and use of mulch or ground-cover.

TABLE 1

## ARTHUR HOYT SCOTT HORTICULTURAL FOUNDATION

SWARTIMORE, PENNSYLVANIA

## SELECTED MAINTENANCE FIGURES

December 1, 1976 - November 30, 1977

<u>Collection</u>	<u>Total Man Hrs.</u>	<u># of Plants</u>	<u>Acreage</u>	<u>Man Hrs. Per Plant</u>	<u>Man Hrs. Per Acre</u>
Dean Bond Rose Garden	1,192	700	$\frac{1}{2}$ acre	1.7	2,384
Fraser Holly Collection	455	400	$3\frac{1}{2}$ acres	1.1	114
Magnolias	108	40	3 acres	2.7	39
Crabapples*	172	75		2.3	
Tree Peonies	198	250	1 acre	0.8	198
Glen Dale Azaleas	204	500	1 acre	0.4	204
Lilacs	64	320	$1\frac{1}{2}$ acres	0.2	43

\* This collection is spread over several areas on campus making a reliable acreage figure hard to establish.

TABLE 2

JOHN J. TYLER ARBORETUM

LIMA, PENNSYLVANIA

## SELECTED MAINTENANCE FIGURES

January 1, 1977 - December 30, 1977

<u>Collection</u>	<u>Total Man Hrs.</u>	<u># of Plants</u>	<u>Acreage</u>	<u>Man Hrs. Per Plant</u>	<u>Man Hrs. Per Acre</u>
Rhododendrons	441	4,000	6 acres	0.1	74
Magnolias	44	20	$\frac{1}{2}$ acre	2.2	88
Lilacs	231	65	$\frac{1}{2}$ acre	3.6	462
Cherries	134	30	1 acre	4.5	134
Crabapples	385	100	3 acres	3.9	128

1  
13  
1

### 3. Poor Display

A third result of undisciplined collecting is overcrowding, with the inevitable result that the plants are poorly displayed and the original garden design obscured. When overcrowding becomes severe the plants become poor specimens in themselves. In some situations, such as taxonomic research collections, this is not a problem. However, in most gardens some or all of the plant collections are grown for the stated purpose of demonstrating design attributes such as plant form or ultimate size to the home gardener. What purpose does a tangled mass of greenery serve in these cases?

Brooklyn Botanic Garden, New York City, serves as a good example of a garden that faced this problem of overcrowding and poor display. Opened in 1910, by 1930 almost all of the Garden's fifty acres were crammed with plants. In 1944 Dr. George S. Avery, Jr. became Director of a Garden that was suffering not only from the ravages of the war years, but also from having 12,000 taxa planted in a relatively small acreage. During his tenure as Director, Dr. Avery gradually reduced the holdings to 8,000 taxa and had vistas opened up by removing the systematic family beds that occupied today's open lawn areas. Finally the public was able to see specimen trees and shrubs as they were supposed to be seen. Mr. Frederick McGourty, Jr., presently Editor, Plants and Gardens, was Associate Taxonomist at Brooklyn during the latter portion of Dr. Avery's cutbacks



and described to me the extensive justifications he had to make to Dr. Avery before being permitted to accession new plants. Dr. Avery would always ask Mr. McGourty to consider who would follow up on these plants, who would maintain them and evaluate them.<sup>11</sup>

According to Mr. McGourty, despite his efforts Dr. Avery would probably not say he had solved the problem of accessioning only plants really needed in the Garden. During the 1950's Dr. Avery began to develop a lilac collection. Having asked Dr. John Wister, then Director of the Scott Horticultural Foundation and a noted authority on lilacs, for recommendations on the 125 best lilacs, Dr. Avery secured these 125 "bests" from nurseries and other gardens. Today Dr. Avery estimates only 20-30 are really worthy of places in the Garden since many are so similar as to make it hard for the home gardener to distinguish one from the other. Dr. Avery, having retired from the position of Director, still takes an active interest in the Garden, and was, in the spring of 1977, pruning the lilac collection, ruing the day he decided to plant as many as 125 "best" lilacs.<sup>11</sup>

#### IV. The Need for a Baseline

A further reason for establishing a policy for collection development in a garden is the need for some baseline from which garden personnel, trustees and others can judge progress at the garden in upcoming years. A garden that starts life under a charter as general as to collect everything hardy in that location, without a policy specifically relating to the plant collections, is at an obvious disadvantage when it comes to progress evaluation. In most situations, because of limited land, personnel, and financial help, there is no possible way to adhere to the charter. As a result, plant collecting is haphazard, a little of this plant group because the plants were donated, and a lot of that group because one member of the garden staff has a particular interest in that portion of the plant kingdom. Gradually collections develop, but since no plan was developed at the outset, it is hard to judge if the garden's collections are developing in an appropriate fashion.

The importance of having a baseline was emphasized by Mr. William E. Coates, Landscape Architect, during discussions regarding the development of the University of Guelph Arboretum Master Plan.<sup>3</sup>

"A combination of academic need, a long history of interest in an arboretum spanning eighty-eight years, and availability of an outstanding site" <sup>14</sup> led to the completion of the Arboretum Master Plan in October 1970. This extensive document was the work of Mr. Coates in consultation with the Arboretum Planning Committee representing University programs in botany, horticulture, landscape architecture, biology and zoology. The Department of Physical Resources was also represented on the Committee.

The Master Plan deals with all aspects of Arboretum development, but for the purposes of this paper only those items that relate directly to the development of the living plant collections will be considered. Initially, under "Concept and Development Criteria," the collections are mentioned in general terms:

Plant collections and facilities shall be related to the needs of the various academic uses of the University. Primary emphasis shall be placed on the study of woody plants.

Later more detail is added:

Each species, variety or cultivar shall be represented by at least one plant in each collection. Where a given item is not repeated in other collections there should be an absolute minimum of two specimens but with three to five as an optimum number. Framework plantings, incorporating plant collections wherever possible, and an open space system should be used to define specific areas, limit views and organize the entire site. The limits of these two defining elements should be accurately defined in the Master Plan and shall be subsequently maintained as such without encroachment.

This last sentence surely provides for adequate open spaces in the University of Guelph Arboretum.

Following these general discussions of the plant collections is detailed information on forty-four "Arboretum Facilities." These facilities include "Vehicular Circulation and Parking," "Natural Wooded Areas," and twenty-seven facilities which compose the plant collections. Tables 3 - 5 show examples of how these facilities are defined. Each collection has a specified principal use or uses, area required for planting, a list of the plants involved, cultural requirements and limitations, and priority for development. In addition, there may be a note referring to other requirements. As can be seen by comparing Tables 3, 4 and 5, in some cases there is a definite number of genera to be included in the collection (Table 3 - Native Tree Collection). For some collections the principal use is well-defined, as in the Betulaceae Collection (Table 4): "To display for taxonomic purposes" compared to the more general uses of the Fall Colour Collection (Table 5):

These are to be used for studies in general horticulture, landscape planning, general display, ecology, taxonomy and in physiological-biomedical studies on leaf pigments.

In this Fall Colour Collection the plants to be involved are not well defined: "Trees and Shrubs - 100 - 150 spp and cvs." <sup>14</sup>

TABLE 3

UNIVERSITY OF GUELPH ARBORETUM, GUELPH, ONTARIO  
MASTER PLAN

NATIVE TREE COLLECTION

Principal use: To display typical examples of the trees native to Canada and to provide an area where additional unusual or mutated strains of these trees can be grown, displayed and studied.

Physical Characteristics:

Area required: 5.4 acres

Plants involved:

Abies	4 spp	Pinus	9 spp
Acer	16 spp/cvs	Populus	6 spp
Betula	6-10 spp/cvs	Prunus	2 spp
Carya	4 spp	Pseudotsuga	2 spp
Cornus	2 spp	Quercus	9 spp
Crataegus	4 spp	Sorbus	2 spp
Juglans	2 spp	Thuja	2 spp
Juniperus	2 spp	Tsuga	2 spp
Picea	4 spp	Ulmus	3 spp
and 24 other genera and spp.			

Cultural requirements and limitations:

Soil type: Deep, medium loam in most of area with other types available to provide variability.

Wind exposure: Sheltered to full exposure

Sun exposure: Variable - sun to shade

Priority: Third

TABLE 4

UNIVERSITY OF GUELPH ARBORETUM, GUELPH, ONTARIO  
MASTER PLAN

BIRCH AND ALDER COLLECTION  
(Betulaceae Collection)

Principal use:	To display for taxonomic purposes, the range and variety of species and cultivars of Betulaceae family plants.
Physical characteristics:	
Area required:	3.9 acres
Plants involved:	i) Trees Betula to 23 spp and to 20 cvs Alnus to 2 spp and 5 cvs ii) Shrubs Alnus to 10 spp and 18 cvs Corylus
Cultural requirements and limitations:	
Soil type:	Sand gravel for most Betula
Drainage:	Good for most Betula - poor for Alnus and some Betula
Slope:	Preferred
Wind exposure:	) Variable to permit all species and
Sun exposure:	) cultivars to be grown satisfactorily.
Relationship with other facilities:	Alnus and some Betula could be associated with Salix and Populus Collection.
Other requirements:	Use of low lying area for Alnus and some Betula since main effect is due to bark colour in winter, could be close to water or in contrast to sky by planting (for some) on hill top.
Priority:	First

TABLE 5

UNIVERSITY OF GUELPH ARBORETUM, GUELPH, ONTARIO  
MASTER PLAN

FALL COLOUR COLLECTION

Principal use:	To provide a collection of woody plants, all of which develop colourful pigmentation prior to leaf fall. These are to be used for studies in general horticulture, landscape planning, general display, ecology, taxonomy and in physiological-biomedical studies on leaf pigments.
Physical characteristics:	
Area required:	2.1 acres
Plants involved:	Trees and shrubs - 100 to 150 spp and cvs.
Cultural requirements and limitations:	
Soil type:	) Variable to permit full range of plants to be grown satisfactorily.
Drainage:	
Slope:	
Wind exposure:	
Sun exposure:	Fall foliage colour effects in most of the area.
Relationship with other facilities:	Could be planned close to or associated with Maple Collection.
Priority:	Third

In discussions Mr. Coates described the traditional client-designer approach used in the development of this Arboretum Master Plan. In this case the client was the University of Guelph, as represented by the various departments listed above. Mr. Coates asked each Department to submit its ideas on the optimum development of the Arboretum, including lists of desired plant collections. He then conducted topographic, drainage and soil surveys and attempted to fit the individual requirements into the site. This planning process, completed in October, 1970, took two and one half years.

Mr. Coates emphasized that the Master Plan will probably never be adopted in its entirety, but considers it important to have as a base plan 1) by which Arboretum personnel and the Arboretum Committee can be guided in upcoming years, 2) against which they can balance proposed future developments, and 3) against which they can judge progress as the years go by. In addition, this document forced the University to make a long-range land-use commitment. Here were documented needs for living plant collections as expressed by several University departments. Surely, when University officials are studying their land holdings in an attempt to find a location for a new dormitory, laboratory building, or sports field, this document will be more resistant to pressure than a general charter designating "x" acres of land to be used as an Arboretum.



When Dr. R.J. Hilton, Director of the Arboretum, discussed the implementation of the Master Plan, he indicated that the changes made were with regard to timing rather than content. In 1974, for example, alumni and faculty made donations to the Alma Mater Fund, and the Ontario Ministry of Agriculture and Food gave a commemorative grant to celebrate the Ontario Agriculture College (now the University of Guelph) centennial. These funds made possible the development of the OAC Centennial Arboretum Centre, a building Dr. Hilton had initially not expected to be able to build for several years. Other deviations from the Master Plan, such as the relocation of the Arboretum nursery, the Director has formally discussed with the Arboretum Committee representing the various groups in the University that use the Arboretum facilities. <sup>7</sup>

V. Protecting the Long-Term Interests of the Garden

A well-established, up-to-date policy for the living collections also has the benefit of protecting the long-term interests of every garden. In The Prospective Role of an Arboretum the authors note that the

long-term perspective of an arboretum makes it essential that basic organizational and physical arrangements be relatively immune to the transience of individual interests and yet able to assimilate their contributions to its objectives. <sup>15</sup>

A policy specifically related to the development of the plant collections at the Royal Botanic Garden, Edinburgh, for example, might have avoided the decline in the state of the living collections during the 1950's and 60's when attention was devoted to the flora of the Mediterranean and South West Asia. Since the staff was unable to grow most of these plants in the Edinburgh climate, this project became mainly an herbarium interest to the detriment of the living plant collections.<sup>4</sup>

On the other hand, what about the importance of the organizational and physical arrangements being able to assimilate the contributions of individual interests to the objectives of a garden? As a study of the history of botany and horticulture will show, knowledge of many plant groups would not have advanced had it not been for the burning interest of one individual in a special group. The collections policy must therefore be sufficiently tight that all interests will serve the main goals of the garden, and yet loose enough so that individual creativity is not stifled. This is hard to achieve and can only be done through careful planning and frequent discussions with all staff members to make sure they comprehend the main objectives of the garden. Administrators should also discuss these objectives in detail with proposed new staff members.

VI. Evaluating Staff Accessions and Donations from Outside Groups

Garden directors and others in charge of plant accessions, are often beset by two well-meaning groups of people - their own staff, and outside horticulturists wishing to donate plants - who may attempt to fill the garden with plants that do not fit in with the overall scheme. In these situations the policy-less director can be accused of making a completely arbitrary decision in refusing to accession plants. The director who has a well-established policy, on the other hand, can reason with certainty that these plants do not belong in this particular garden. In some cases the policy may be "suspended" to accommodate a specific situation. This very suspension, however, ensures a conscious decision by more than one person, rather than a rapid move that may cause embarrassing maintenance costs in years to come.

VII. Promoting National/International Co-operative Efforts

Until each garden, large or small, has its own house in order there is little hope that our national or international co-operative efforts regarding plant collections will be fruitful. It will probably be many years before people can agree which

garden/gardens will be the official keeper of this or that genus, but an obvious step in this direction would be for each garden to make a conscious decision as to its own collections.

As Richard Jaynes wrote "There is a danger for horticulturists and their institutions to dabble and collect everything at the risk of not being outstanding in anything."

Advantages, he considers, can accrue to researchers, plant societies, nurserymen and individual institutions if each garden or arboretum "has a definitive collection of one or more genera." <sup>10</sup> In a letter to Dr. Jaynes I asked if "every garden and arboretum can afford to maintain a definitive collection?" In response Dr. Jaynes noted that most gardens already have special collections and should make a more conscious effort to develop "comprehensive collections of particular genera, especially in the light of what other gardens (arboreta) already have." <sup>9</sup> "Choices" he continues

are already made by all gardens and arboreta as to what plants they will grow. Obviously they have short term immediate goals or public education but without some longer term objectives that are of value to the science of botany and horticulture they may hardly distinguish themselves from a well landscaped nursery or garden center. <sup>9</sup>

CHAPTER I

BIBLIOGRAPHICAL NOTES

1. American Association of Botanical Gardens and Arboreta, Newsletter #38, February 1978.
2. Bunting, George S. and Vrugtman, Freek, "Origin of Specimens: An essential datum in Plant Records." American Association of Botanical Gardens and Arboreta, Quarterly Newsletter, Issue No. 66 (April, 1966).
3. Coates, William E., Landscape Architect, Guelph, Ontario, Canada. Personal interview with author, October 27, 1977.
4. Cullen, James, Assistant Keeper, Royal Botanic Garden, Edinburgh. Personal interview with author, June, 1976.
5. Dourley, John, Superintendent, Rancho Santa Ana Botanic Garden, Claremont, California. Personal interview with author, January, 1978. Additional communication, February 28, 1978.
6. Everett, Percy C. A Summary of the Culture of California Plants at the Rancho Santa Ana Botanic Garden. Claremont, California: Rancho Santa Ana Botanic Garden, 1957. 7
7. Hilton, Robert, J., Director, University of Guelph Arboretum, Guelph, Ontario, Canada. Personal interview with author, October 28, 1977.
8. \_\_\_\_\_, Royal Botanical Gardens, Hamilton, Ontario, Canada, Technical Bulletin, No. 6.
9. Jaynes, R.A., Geneticist, Connecticut Agricultural Experiment Station, New Haven, Connecticut. Personal correspondence with author, August, 1977.
10. \_\_\_\_\_, "Mountain Laurel - Cinderella of the Forest." The Bulletin, American Association of Botanical Gardens and Arboreta, 10:2 (April, 1976), pp. 39-41.
11. McGourty, Frederick, Jr., Editor, Plants and Gardens, Brooklyn Botanic Gardens, Brooklyn, N.Y. Personal interview with author, April 5, 1977.

12. Taylor, Roy L. "Flower Power - Second Phase - Are We Ready To Meet the Challenge?" The Bulletin, American Association of Botanical Gardens and Arboreta, 10:2 (April, 1976), pp. 29-34.
13. Thompson, P.A. "The Role of the Botanic Garden," Taxon, 21:1 (February, 1971), pp. 115-119.
14. University of Guelph, Ontario, Canada. Arboretum Master Plan. The Arboretum Planning Committee and William E. Coates, Landscape Architect, October, 1970.
15. Wright, Christopher, ed., The Prospective Role of an Arboretum. A Report Prepared Under the Auspices of the Institute for the Study of Science in Human Affairs, Columbia University (ISHA Bulletin #10). Mentor, Ohio: The Holden Arboretum, 1972.

## CHAPTER II

### COLLECTION POLICIES CURRENTLY OPERATING IN SELECTED BOTANICAL GARDENS AND ARBORETUMS

#### Introduction

When faced with the problem of finding gardens which have collection policies, I was happy to discover a survey "Collecting Plants - Why Bother" <sup>15</sup> which Mr. Gary L. Koller and Mr. Richard A. Brown mailed to 237 gardens during the summer of 1976 on behalf of the Collections Committee of the American Association of Botanical Gardens and Arboreta (AABGA). 118 gardens responded to this survey.

From the 28 gardens replying in the affirmative to the first question on the survey: "Does your institution have a

written policy or charter which serves to delimit the nature of your collection(s)?"<sup>15</sup> I selected some gardens for more detailed study.

Where possible I visited these gardens to discuss the policies directly with garden personnel. In addition, I talked with the directors and staff members of several gardens at the Annual Meeting of the AABGA in St. Louis, Missouri in April, 1977. A less satisfactory method was to seek further information by sending my own questionnaire to the Directors of those gardens responding in the affirmative to the question mentioned above with whom I was not able to talk personally.

I must emphasize here that I make no pretense of having followed scientific methods in my inquiries. I soon discovered that the kind of information I sought is best obtained through discussion, and that the longer I spent in an institution the more balanced a judgment I was able to make regarding their collections policies - or lack of them. A case in point was the County of Los Angeles, Department of Arboreta and Botanic Gardens. At the 1977 Annual Meeting of the AABGA I sought out Mr. Francis Ching, Director of this Department, with the express purpose of discussing the collections policies of his Department. Having never visited the garden, my questions were poor; not having been previously acquainted with me, his answers were somewhat evasive. At the end of our discussion I was little wiser



regarding their collections policies than I had been at the outset. Some time later I was fortunate enough to spend a month at the Los Angeles State and County Arboretum and gradually came to understand the collections policies which I will discuss in detail later in this chapter.

In addition to my communications with garden personnel in North America, I corresponded with a few selected gardens overseas, visited the Royal Botanic Gardens, Kew, and had two very productive discussions with Dr. James Cullen at the Royal Botanic Garden, Edinburgh, Scotland. Since the staff of this Garden has formulated a very detailed policy for its living plant collections I will begin my series of examples with this policy and cover it in detail.

Findings from Personal Communications with Garden Personnel  
Regarding Collection Policies

I. Royal Botanic Garden, Edinburgh

While participating in a Conservation Conference held at the Royal Botanic Gardens, Kew, during September, 1975, Dr. James Cullen, Assistant Keeper, Royal Botanic Garden, Edinburgh, spoke directly to the need for careful planning in the development of living plant collections in a paper entitled "The Use of Record Systems in the Planning of Botanic Garden Collections."

(Appendix 3)<sup>8</sup> The concept of collection planning is, according to Dr. Cullen, a departure from the traditional fashion in which collections in many European gardens have "just grown." However, since the time, money and expertise expended on these collections is great, Dr. Cullen considers that such "ad hoc, unscientific methods of acquisition are no longer tolerable." In the future, Dr. Cullen noted, "botanic garden collections must be planned both within and between gardens so that the best use can be made of scarce and diminishing resources."

When planning a living collection Dr. Cullen emphasizes that environmental and staffing constraints, and the garden's purposes must be taken into consideration. The stated purposes will obviously vary greatly from one garden to the next, but for

convenience Dr. Cullen groups them under the following general headings: amenity, direct education, indirect education, direct research, indirect research and conservation.

At Edinburgh the overall plan for the living collections is "taxonomically based, using families (and to some extent genera) as the working units."

Having carefully considered the Garden's purposes and maintenance capabilities, the staff's first step was to establish five priority levels for the collections. Those families required for direct research and direct teaching were assigned the highest level of priority. Within these families Garden personnel are attempting to "obtain as much material as possible, preferably of wild origin, and to replace stocks of unknown origin by material fully recorded."

No problems arise in the selection of plants for this highest level of priority. When attempting to decide which plants fulfill the indirect research and education functions the situation becomes more complex. To fulfill these functions, Dr. Cullen considers the Garden must hold a "general representation of the world's flora." However, since no one has clearly defined this concept, the mixture gathered by "ad hoc" and "unscientific" methods was previously considered the best approximation of this general representation.

Under the new system, the second priority level contains

- a) families related to those in the highest priority level, which may become important as research progresses,
- b) families already well represented in the existing collection, for which expertise and suitable climatic conditions are already available, and c) families which may well be used in direct research at Edinburgh in the future.

In the third level are families in which the staff has no direct research interest but for which personnel require an adequate level of representation, while in the fourth are those families considered "unsuitable for large scale culture in Edinburgh." The lowest level consists of "families that are impossible or extremely difficult to represent....: parasites, saprophytes, and other difficult cases."

In order to make concrete decisions as to which taxa would fulfill the desired functions within these priority levels, the staff found the number of genera within a family the most convenient measure. However, Dr. Cullen comments, "The relationship between the number of genera thought to give an adequate representation and the number of genera in the family is a complex one ...." In larger families, containing more than twenty genera, they have

considered 10 percent of the genera to be an adequate representation for temperate families, and 4 percent for tropical or otherwise difficult families. For smaller families the figure rises to a theoretical 100 percent for monogeneric families, whether tropical or temperate.

Adolf Engler's Syllabus der Pflanzenfamilien

(ed. 12, 1954) was used as a "moderate but conservative treatment ... for deciding which families should be recognized." <sup>18</sup> Appendix 4 shows the decisions the staff made regarding the desired generic representation within each family. When confronted with the choice of species within genera, the staff uses the same guidelines. However,

some genera, because of their high ornamental value ... will tend to be greatly over-represented, .... other genera will be poorly represented, because of their generally unprepossessing appearance.

The staff at the Royal Botanic Garden, Edinburgh has made an enormous effort to tackle this problem of collection evaluation and development. Dr. Cullen makes it abundantly clear, however, that their attempts are only "guidelines to be interpreted flexibly rather than rigidly." <sup>8</sup>

During my second discussion with Dr. Cullen in September, 1977 he indicated that they were making slow, steady progress with their collection evaluation. However, he considers it advantageous that this progress is slow since the staff must carefully consider whether each plant in the collection is indeed appropriate. <sup>9</sup>

## II. Fairchild Tropical Gardens

The staff of the Fairchild Tropical Gardens, Coral Gables, Florida, use the two documents discussed below to guide the development of their living plant collections.

### 1. Criteria for Making Plant Accessions, Essentially Perennial Ornamental and Botanical Species, at The Fairchild Tropical Gardens

These criteria (Appendix 5), established as a result of a study done by a Committee of the Board of Trustees, were adopted by the Board in 1961. According to Dr. John Popenoe, Director, the major reason for developing the criteria was that the Garden was besieged by donations of plants unsuited to the original purpose of the Garden: to develop and display collections of palms, cycads and pandanus. Beyond these special collections, the garden staff had to be extremely cautious in their plant accessions. Not only were space and maintenance funds limited, but the infinite number of taxa that can be grown in the sub-tropical climate at Fairchild gave the staff a potentially enormous range of plants from which to choose. Dr. Popenoe inherited these criteria from the previous director and, although he has reviewed them periodically during his fourteen-year tenure at the Gardens, he has found no way to improve upon them. <sup>17</sup>

Periodic review, and having the staff fully aware that such criteria exist are two important elements in the success of Fairchild's approach. When I visited the Gardens in January, 1977, I found the criteria tacked up in several garden offices as well as in the greenhouses at the Nursery. In addition, Dr. Popenoe indicated that he frequently meets with his staff to discuss the plants that have recently come into the Gardens. If the plant is considered unsuitable for the main collection it remains in the Gardens until it may be sold at the annual "Ramble." Those considered unsuitable for the main collections or for sale are discarded.

2. Categories of Plants Being Grown in Rare Plant House and Their Records (Appendix 6)

In the Fairchild Tropical Gardens Rare Plant House, containing "mainly plants which are too cold-tender for being planted out on the grounds," <sup>10</sup> space is at a premium. Consequently the staff has created four well-defined categories of plants to be grown in this house, with detailed instructions for the labelling and evaluation of each category.

a) Permanent collection of plants

The permanent collection of plants would be mainly species plants with collection information from the native source. These would be of the most importance for the permanent botanical collection of the Rare Plant House ....

If a plant is a scarce one, ... we will try to have two or three plants, otherwise one plant would be sufficient in many cases.

b) Plants being grown solely for display or class use....

c) Plants in unidentified stage

.... To hold these for identification, they must look sufficiently promising and different enough from any similar plants to justify our growing them for a time.

d) Surplus plants

These would be excess plants or propagations not needed for maintaining the permanent collection and not needed for display or as class materials. They would fall into two categories:

(1) Those plants which we might be able to sell and would be grown on until the next plant sale, or possibly used for exchange purposes before that time. We will not pot up and grow on volunteer plants, unless we know what they are and we actually need them.

Before holding surplus plants, we must consider if they are worth the time, space and effort to grow on until the next October or December sale: if not they should be discarded.

(2) Discard - plants which should be thrown out as trash. <sup>10</sup>

It seems as if the group that developed this paper had at least three objectives in mind:

The first obviously, is to make sure that every plant in the Rare Plant House deserves the space it occupies.



The second is to force the accessioner to document the reason for introducing the plant - "At the time of accessioning, the category of plant (permanent collection, expendable, unidentified, etc.) will be determined." <sup>10</sup> This immediate categorization is one way of making staff members record the reason for introducing the plant, rather than allowing it to be brought into the collection with no specified purpose. As every gardener, horticulturist, botanist, or combination of the above knows, once a plant finds a home in a garden, public or private, it often never leaves. In order that garden staff may readily see the category to which a plant has been assigned, plants in the various categories are labelled with different colored labels.

Finally, the authors are attempting to cut down on documentation and labelling where possible, while still maintaining high quality plant records. When a plant is accessioned into the Permanent Collection of the Rare Plant House it is given a nursery (or temporary) card; not until it has been in the Permanent Collection for one year does the Plant Recorder type up the card for the Records Office and mail a copy to the Plant Sciences Data Center in Mount Vernon, Virginia. Hybrid and duplicate plants

used for display... will not have nursery cards maintained....Cultivars and horticultural varieties will have nursery cards to show their existence, but these will only be checked and verified at every other year complete inventory. This would involve such things as begonia and

episcia cultivars which would not be included in the master file or the Plant Record Center. <sup>10</sup>

As indicated in Chapter I, plant documentation is a very important but expensive activity. The staff at Fairchild Tropical Gardens obviously feels it should put its efforts into keeping records that will be of permanent value.

III. County of Los Angeles, Department of Arboreta and Botanic Gardens

At the County of Los Angeles Department of Arboreta and Botanic Gardens, Arcadia, California, henceforward called the Department, three documents were drawn up with respect to the living plant collections.

1. Plant-Introduction Program (Appendix 7)
2. Procedures for Acquisitioning, Accessioning and Record-Keeping, Plant-Introduction Program (Appendix 8)

As can be seen from studying Appendices 7 and 8, these documents have a wider application than their titles would indicate. Not only do they include guidelines for plant introductions (Appendix 7, objectives 1-5), but also references of a more general nature regarding the Department's plant collections (Appendix 7, objectives 6-14).

The first objective of the Plant-Introduction Program that

The seed exchange program with domestic and foreign arboreta and botanic gardens will be continued at the present level to December 31, 1971, at the 50% level to December 31, 1974, and at the 25% level to December 31, 1979, <sup>4</sup>

deals with a problem with which many garden personnel are familiar. Index Semina from all parts of the world arrive at a garden. Horticulturists and botanists pore over these and sometimes order large quantities of seed. The seed arrives, is planted, maybe germinates, and then the propagator is stuck with a greenhouse full of little pots with no specific destination. By this time the horticulturist or botanist may have forgotten why some of the seeds were ordered in the first place. However, since it would be a shame to discard a plant without examining its full potential, it remains in the garden, regardless of whether it could ever serve any purpose in that particular plant collection. Mr. Francis Ching, Director of the County of Los Angeles Department of Arboreta and Botanic Gardens, indicated that at one time they were accessioning 1,750 seed lots per annum from Index Semina. Today they order a maximum of 250 seed lots per annum. <sup>7</sup>

Item 4, Appendix 8 states that

After exchange Index Semina have been checked, the Plant Recorder will check for items that may already exist in our collections. In such cases, the Taxonomist will be notified and a decision will be made on acquisition.

On occasion, staff members will have good reasons for reordering a taxon, on others they are unaware that the reordered plant exists on the garden grounds. Few staff members can remember every plant in a garden, and this checking process has the potential of saving valuable propagation time and space.

Objective 7 in Appendix 7 states that

Plants already on the grounds for many years will be re-examined for their horticultural values in accordance with our stated objectives. A regular turn-over of plantings is needed for future development. Plants found to be horticulturally undesirable will be replaced and this practice will be carried out in the future on a regular basis.

Mr. Ching mentioned that despite these guidelines and good intentions on his part and on the part of his staff, they have been slow at this weeding out process. He hopes to proceed more rapidly in future years. <sup>7</sup>

### 3. Plant Collections Program

Approved by Mr. Ching in June 1977, this supplement to the Plant-Introduction Program identifies the main sections of the Gardens (Appendix 9, Item 2), the major collections of the Department (Item 3), and the specialized educational displays (Item 4).

The Program also states that "Collections for taxonomic, botanical, and other scientific or educational purposes are acceptable as requested or required." However, "once the studies are concluded, the collections will not be retained unless there

are other educational or research values to be obtained." <sup>6</sup>

Large research collections are often a source of embarrassment in many gardens when the individual(s) working on the collection, for one or several reasons, no longer need the plants. Sometimes the collections are movable and can be used in another institution, often they remain in the garden and the level of maintenance gradually deteriorates. No generalizations are possible when considering what the staff of a particular garden should do with these collections. All anyone can ask is that the staff makes a decision on the collection; either it is kept and well maintained, or, if they decide it is now inappropriate to spend maintenance funds on such a collection, it is offered to other institutions before being discarded. This method is far preferable to allowing a poorly maintained collection to stay in the garden for no better reason than that it has been there for many years.

#### IV. The University of Michigan, Matthaei Botanical Gardens

The purposes of the University of Michigan Botanical Gardens, Ann Arbor, Michigan are, in order of emphasis:

(a) University research; (b) Teaching, of both university and non-university students; and (c) Presenting botany to the public. <sup>24</sup>

Appendix 10 shows "The Policy on Collections of the Botanical Gardens." As I was unable to visit the Gardens, it is hard for me to judge the effectiveness of this policy. However, Dr. Erich Steiner, Director, discussed his concern for the Gardens' collections with me at the AABGA Annual Meeting in St. Louis, Missouri, in April 1977, and later in written correspondence. The policy, writes Dr. Steiner, which dates back to 1972, ".... probably should be revised, although it still is largely valid." However, he acknowledges:

In spite of a reasonably clear-cut policy, I must admit that its implementation has not always been as precise as it should be. That depends on staff and their willingness to pay attention to detail, and as you undoubtedly know, personalities differ with regard to such matters. 22

Garden personnel at all levels would probably sympathize with Dr. Steiner's comments.

In his letter Dr. Steiner also refers to two problems that today face many scientifically oriented gardens:

The general collections of the Gardens have, I feel, their greatest value in education on all levels, i.e. for University students down to cub scouts... Their educational value, however, depends upon the proper presentation of the collections to a clientele. Thus, ideally, the curator must work to present them effectively to the viewers. In the same way, collections may be the source of interesting research problems, but these need to be pointed out to students and faculty. Thus....collections need an advocate if they are to serve with maximum effectiveness. Most collections lack this kind of approach; thus their use does not coincide with their potential. I must admit, however, that as far as our biology faculty is concerned, collections no longer

play a very important role in their teaching or research; this is related to changes in the emphasis and direction of the various biological disciplines, but also to the problem referred to above, namely the need for advocacy. 22

Many of the scientific purposes for which these and other living plant collections were established no longer exist, and it requires an imaginative curator to present them in ways that are of interest to the groups that Dr. Steiner mentions.

V. University of Wisconsin Arboretum, G. William Longenecker Horticultural Gardens

The majority of this Arboretum in Madison, Wisconsin is devoted to natural and restored plant communities. There is, however, one area - the Longenecker Horticultural Gardens - which contains labelled plant collections. The original landscape plan, drawn up by Dr. Longenecker, serves as a guide to accessioning new plants for the Gardens, and the actual decisions are in the hands of Dr. E. Hasselkus, representing the Department of Horticulture, University of Wisconsin, on the Arboretum Committee.

In discussions with Dr. Hasselkus at the 1977 AABGA Annual Meeting he indicated that it might be beneficial to the Gardens if this landscape plan were more detailed. Since he worked in close contact with Dr. Longenecker for many years, Dr. Hasselkus is very familiar with Dr. Longenecker's original plans for the

future development of the Horticultural Gardens. In future years, however, garden personnel cannot be expected to be as aware of the concepts behind the initial garden development. 11

A landscape plan has, I consider, limited value as a means of effectively guiding collection development in a large garden. However, such a plan can be very important for designating general areas for special collections, garden facilities, and open spaces as indicated at the University of Guelph Arboretum.

VI. Royal Botanic Gardens, Kew

A personal interview with Dr. Ian Beyer, Deputy Curator, Royal Botanic Gardens, Kew, revealed a statement written at Kew in 1975: "Selection and Despatch of Living Plant Material for the Royal Botanic Gardens, Kew and Wakehurst Place. Notes and Recommendations for Expedition Personnel." Much of the statement concerns instructions for personnel collecting in the field, but under 1:1 Collection Rationale - Living Plant Collections, the statement notes that the requirements of plant conservation, increased scientific usage of the collections, finite space at Kew and Wakehurst and the significant costs required to raise and maintain plants have led to a "change in the policy of curating plant collections." The statement goes on to say that in the 7



past, collections have been diluted by accessions of "unsolicited and largely un-authenticated material...." Today "selective control of accessions" has made it possible for Kew to actively seek authenticated material and "to encourage field collecting by RBG staff....to obtain natural source replacements and additions to the collection." Realizing that they cannot numerically increase the living collections, the Garden staff is concentrating on improving its "quality, range and purpose."

The statement notes that the anticipated publication of the Royal Botanic Gardens' catalogue of plants will be very helpful to field collectors since it will indicate "species already in cultivation." These field collectors are enjoined to collect selectively from desired groups rather than indulging in general collecting. Selective collecting, according to the statement, will not only improve authenticity and documentation, but, since the operators in the field should have a greater familiarity with the plants collected there is more chance of their selecting viable propagules.

The staff at Kew hope that through the use of a computerized record system, collection rationalization will be developed between botanic gardens. Collection rationalization is explained as the situation where a "botanic garden takes on a national or international responsibility for a genus or family and sets about achieving a comprehensive and carefully documented collection...." 19

Findings from Correspondence with American Gardens

Since several of the gardens with whom I corresponded did not have substantial written policies specifically referring to their plant collections, I will only mention below those that contain details which illustrate specific points.

I. Bowman's Hill State Wildflower Preserve

In the "Articles of Organization of the Executive Committee of Bowman's Hill Wildflower Preserve" the stated purpose (a) is to "obtain, plant and maintain at Bowman's Hill a representative collection of native and naturalized flora of Pennsylvania." <sup>2</sup> Although these Articles were adopted in 1962, the Preserve, located in Washington Crossing, Pennsylvania, was established in 1934, and in 1974 the Preserve Committee issued an Appraisal of their past 40 years. In this appraisal the Committee states:

Having reached the age when 'life begins,' it may be well to review the Preserve's lively past in order to guide its future.... Its (the Preserve's) primary aim was and will be the care and perpetuation of plant species native to Pennsylvania. <sup>3</sup>

Not an earth-shattering statement, but probably one that was agreed upon as a result of discussion and self-evaluation. No garden can afford to continue to collect plants for the reasons

they have always collected them without periodical review of these reasons.

II. University Botanical Gardens at Asheville, North Carolina

In the Certificate of Incorporation of Asheville-Biltmore Botanical Gardens (now called the University Botanical Gardens at Asheville), one of the objects for which the Corporation was formed reads in part: "To establish facilities for the collection and culture of native plants." <sup>1</sup> Dr. W. Martin Wadewitz, Director, in personal correspondence writes:

Our board has interpreted native as follows: All plants listed in the Manual of the Vascular Flora of the Carolinas by Radford, Ahles and Bell, the University of North Carolina Press, 1968, can be planted in the University Botanical Garden. <sup>23</sup>

Plants native to North Carolina sounds simple when compared with statements such as a general representation of the world's flora, but the Board of these Gardens has dealt with a point that many gardens - especially those that are new and expanding should also cover - that of defining their references.

III. Missouri Botanical Garden

Correspondence with Mr. Charles A. Huckins, Assistant Chief Horticulturist at the Missouri Botanical Garden, St. Louis, Missouri, revealed that they have no written policy or statement which guides the overall development of their collection of

living plants. Mr. Huckins wrote, however, that decisions as to which plants will be added to the living collection are made by three people: "The Director, Dr. Peter H. Raven; the Curator of Hardy Plants, John E. Elsley; and the Curator of Tropical Plants, myself." Mr. Huckins commented that although

the criteria which each of these three people use in deciding which plants will be included...will...vary.. based on personal preference,...the Director has established a fairly clear set of criteria for inclusion of plants in the collection. The primary criteria are botanical diversity, value as economic plants, or plants which have other demonstrable interests to man (for example biblical plants, etc.), plants of horticultural value in the midwestern United States, native plants of Missouri, ornamental plants which are not hardy but which enhance the beauty of the garden's collection under glass and in seasonal displays, plants which have specific utility in the garden's educational programs, and plants which have particular interest to our staff of botanists involved in taxonomic research. 13

#### IV. Huntington Botanical Gardens

Mr. Myron Kimmach, Superintendent of Huntington Botanical Gardens, San Marino, California, also wrote that they have no written policy or statement specifically related to the Gardens' living plant collections. The criteria they use are as follows:

Enlargement or improvement of our specialized collections (palms, succulents, roses, herbs, cycads, etc.) where space and facilities allow it. With succulents we try to limit accessions to plants or seeds with wild locality data so plants can be used to make herbarium specimens or for research. Plants that do poorly in this area or are not sufficiently attractive or interesting are eliminated to make room for new plants

untested here. We average 2400 new accessions yearly, nearly all brought in by myself, the botanist and the horticulturist, all of whom are specialists with certain groups of plants. Enthusiasm does tend to bring in more plants than we can adequately take care of and the nursery tends to become overcrowded.

His response to my question "Have you made any co-operative agreements with other botanical gardens or arboreturns regarding specialization in one group of plants...?" was as follows:

The Los Angeles Arboretum, just 4 miles away, tends not to have succulents or palms because of our large collections and we avoid California native plants because of the proximity of three other large public gardens in this area specializing in these plants.<sup>14</sup>

V. Waimea Arboretum

Finally, the policy of this Hawaiian Arboretum established in 1972 in Haleiwa, on the island of Oahu, reads in part:

The emphasis will be on all kinds of plants from the tropics...The primary role of the Arboretum will be to cultivate the endangered plant species and to distribute them widely.

In addition, in 1974, the Arboretum established a Research Collections Project. Since taxonomists of tropical plants (to the regret of subsequent researchers) are often forced to discard plant collections on which studies have been

completed, the Waimea Arboretum offers as part of this project to accommodate some of these collections on their Oahu site. In exchange for "a guarantee that the Arboretum will be able to hold stocks of the plants as part of its permanent collection," the staff of Waimea will make every effort to "follow the wishes of those submitting plants." <sup>16</sup> Herbarium specimens and living material will be provided when required.

When Erling Hedemann, Jr., Director of Waimea Arboretum, sent me the information on this project he wrote, "The list of collections being cultivated is constantly under review.... inevitably it gets longer and not shorter." <sup>12</sup>

### Findings from Correspondence with Gardens Overseas

Attempts to elicit information from a few selected gardens overseas were not wholly successful. I assume this failure was due to the problem mentioned earlier in this Chapter: that this type of information is hard to document in a questionnaire. Dr. H. Brian Ryecroft, Director, National Botanic Gardens, South Africa, however, indicated that accessions in these gardens are carefully planned.

#### I. National Botanical Gardens of South Africa

In a paper presented at the 26th Congress of Park and Recreation Administration (S.A.), Cape Town, October 1974, Dr. Ryecroft described the purposes of the National Botanic Gardens as follows:

The gardens at Kirstenbosch were established in 1913... with the specific purpose of growing only plants indigenous to our own land, South Africa. To accommodate the entire, vast South African flora of close on 200,000 species in our garden with its peculiar soil and complex climatic characteristics, is obviously a biological and horticultural impossibility. 20

Ryecroft goes on to explain that they established "regional botanic gardens in South Africa, each to be concerned with the natural flora of its own particular ecological, climatic or geographical area." 20 Each of these regional gardens "has a

very special, definite and specific policy to cater for the natural flora of a selected ecological, geographic or climatic area." 21

As can be seen from this review of collection policies in foreign and domestic botanical gardens and arboretums, the staff of these institutions have adopted various ways and means to plan for the orderly development of the living plant collections in the gardens under their direction. No two policies will ever be exactly the same, and successful ones can only come about through careful consideration of the various points covered in Chapter IV.



Chapter II

Bibliographical Notes

1. Asheville-Biltmore Botanical Gardens, Asheville, North Carolina, Certificate of Incorporation, March 20, 1961.
2. Bowman's Hill Wildflower Preserve, Washington Crossing, Pennsylvania. Articles of Organization of the Executive Committee for Bowman's Hill Wildflower Preserve, June 21, 1962.
3. \_\_\_\_\_, Appraisal 1934-1974.
4. Ching, Francis. Plant-Introduction Program. County of Los Angeles Department of Arboreta and Botanic Gardens, Arcadia, California, January 1, 1971.
5. \_\_\_\_\_, Procedures of Acquisition, Accessioning and Record Keeping, Plant-Introduction Program, County of Los Angeles, Department of Arboreta and Botanic Gardens, January, 1971.
6. \_\_\_\_\_, Plant Collections Program. A Supplement to the Plant-Introduction Program, June 1, 1977.
7. \_\_\_\_\_, Personal interviews with author, January, 1978.
8. Cullen, James. "The Use of Record Systems in the Planning of Botanic Garden Collections." The Function of Living Plant Collections in Conservation and in Conservation Oriented Research and Public Education. Conference held at Royal Botanic Gardens, Kew, England, 2-6 September, 1975.
9. \_\_\_\_\_, Assistant Keeper, Royal Botanic Gardens, Edinburgh, Scotland. Personal interview with author, September, 1977.
10. Fairchild Tropical Gardens, Coral Gables, Florida. Rare Plant House - Purposes and Objectives.
11. Hasselkus, E., Department of Horticulture, University of Wisconsin, Madison, Wisconsin. Personal interview with author, April, 1977.
12. Hedeman, Erling, Jr., Director, Waimea Arboretum, Oahu, Hawaii. Personal correspondence with author, July 31, 1977.

13. Huckins, Charles A., Assistant Horticulturist, Missouri Botanical Garden, St. Louis, Missouri. Personal correspondence with author, July 21, 1977.
14. Kinnach, Myron, Superintendent, Huntington Botanical Gardens, San Marino, California. Personal correspondence with author, 1977.
15. Koller, Gary L. and Brown, Richard A., "Collecting Plants - Why Bother?" Survey conducted on behalf of Mid-Atlantic Region of American Association of Botanical Gardens and Arboreta, Summer 1976.
16. Notes from Waimea Arboretum. Vol 1.
17. Popenoe, John, Director, Fairchild Tropical Gardens, Coral Gables, Florida. Personal interview with author, April, 1977.
18. Royal Botanic Garden, Edinburgh, Scotland. Garden Acquisition and Holdings.
19. Royal Botanic Gardens, Kew, England. Selection and Despatch of Living Plant Material for the Royal Botanic Gardens, Kew and Wakehurst Place.
20. Rycroft, H.B., "Cultural and Scientific Significance of the National Botanic Gardens of South Africa." Paper presented at 25th Congress of Park and Recreation Administration (S.A.), Cape Town, October, 1974. Reprinted in Park Administration, XXVII:1 (January, 1975).
21. \_\_\_\_\_, "Plants and Gardens of South Africa." Arnoldia, 32:5 (September, 1972), pp. 220-225.
22. Steiner, Erich, Director, Matthaei Botanical Gardens, University of Michigan, Ann Arbor, Michigan. Personal correspondence with author, May, 1977.
23. Wadewitz, W. Martin, Director, University Botanical Gardens at Asheville, North Carolina. Personal correspondence with author, 1977.
24. Wagner, W.H., Jr. and McWilliams, E.L., "University of Michigan Botanical Gardens Special Collections," The Bulletin, American Association of Botanical Gardens and Arboreta, 2:2 (April, 1968), pp. 43-46.

## CHAPTER III

### COLLECTION POLICIES IN MUSEUMS AND LIBRARIES

#### Introduction

A well-balanced collection....will not be achieved by passively acquiring only what happens to be offered or, on the other hand, by promiscuously gathering everything that can be obtained. <sup>4</sup>

These words could be addressed to participants at an annual meeting of the American Association of Botanical Gardens and Arboreta, the American Association of Museums, or the American Library Association. The personnel of botanical gardens, arboretums, museums and libraries face similar problems with their collections: a vast array of materials from which to make their selections, and a limited amount of space, curatorial help and maintenance funds with which to care for the items in the collections.

### Collection Policies for Museums

The collection problems listed above are common to both gardens and museums. Museums administrators, however, face some problems with respect to their collections which are especially severe in their type of institution.

I. Problems are incurred with illegal importation of materials from abroad, or items purchased illegally. In order to protect themselves from these pressures several museums have developed very detailed collection policies to ensure that

The administration and curatorial staff entrusted with the care of the collections shall act in a responsible, ethical and legal manner in the acquisition and disposition of....objects. <sup>1</sup>

Garden personnel also face this problem with respect to endangered species legislation.

II. At times there may exist a conflict of interest between a staff member's collecting for their own collection and collecting on behalf of the museum for which they work.

III. Museum personnel have the potential of continually upgrading their collections by selling objects in order to raise funds to purchase higher quality items. This potential

makes it essential that museums should:

1. be careful when accepting donated items that these are not so heavily restricted that the museum will have to hold them in their collections regardless of unforeseen future developments.

2. clearly define their deaccession policy.

Collection/accession policies from the Delaware Art Museum, the Seattle Art Museum, and the Field Museum of Natural History, Chicago will serve to illustrate how a few museums are dealing with these pressures.

#### I. Delaware Art Museum

##### Policy Recommendations by the Accessions Committee

These Policy Recommendations (Appendix 11) are divided into two sections:

##### 1. General Philosophy

In this section the Committee notes that

The Museum should build in areas where it has now demonstrated strength, as well as keeping up with current developments in the arts...Our limited resources will prevent us from embarking on any radically new areas of collecting. <sup>3</sup>

This general statement is developed further in the following paragraph by reaffirming the "Museum's commitment to collecting exclusively in the field of American Art." <sup>3</sup> Mr. Charles L. Wyrick, Jr., Director, indicated that prior to the writing of these Recommendations no written policy regarding the collections had existed, only a general statement of purpose in the Trustees handbook. <sup>6</sup>

One of the main reasons for developing these Policy Recommendations was the desire of the Director and the Board to develop collections which would complement those of neighboring institutions in order to create a "unified regional resource." <sup>3</sup> Paragraph 4 of Appendix 11 deals with this admirable attempt at regional cooperation.

## 2. Specific Recommendations

In this section the Committee makes recommendations on the specific guidelines to be followed in the individual collections. For example

One of the weaknesses in the survey of American art from 1840 through 1925 is sculpture. Efforts should be made to purchase representative examples by major sculptors of this period... <sup>3</sup>

The final paragraph, dealing with photography purchases, gives some idea of the Committee's deep commitment to regional cooperation.

Mr. Wyrick indicated that the Board and staff of the Museum found the discipline of drawing up these Recommendations to be extremely healthy. It made them study the original, vague stated purposes of the Museum in the light of today's pressures, and to evaluate critically their present holdings.<sup>6</sup>

## II. Seattle Art Museum

### Accessions Policy

Here again, the Policy is to build on the strengths of the Museum's present collections, while enhancing the quality of fields less strongly represented. Appendix 12 contains the whole text of the Accessions Policy. Two items deserve special mention.

1. In paragraph 5 the Policy states that "Although adherence to priority lists is difficult, the Curators should maintain desiderata lists which have the concurrence of the Collections Committee."<sup>5</sup> Instead of waiting to see what plants are available, many living collections would benefit greatly if botanists and horticulturists would draw up such desiderata lists, and actively seek these plants. Then, to the envy of their colleagues in the museum field, they would, in many cases, be able to secure propagation material.

2. In paragraph 5 the writers mention the Committee on the Collection, acting for the Board of Trustees, which reviews the recommendations made by the staff. Here is a vital component of any collections policy - a review board before which accessions must be passed. Because of the initial financial outlay required to purchase many of the items accessioned by museums, this type of review is more vital in a museum than in a botanical garden, but the principle of checks and balances still applies when dealing with plant accessions.

### III. Field Museum of Natural History

In his foreword to this Policy Statement, E. Leland Webber, Director, Field Museum of Natural History, Chicago, Illinois, explains that

with the growing public awareness of the significance of large museum collections, trustees and staff of the Field Museum have felt increasingly that these procedures (for accessions and deaccessions) needed to be systematized and formalized into policy. <sup>2</sup>

Much of the information in this sixteen-page statement is too far removed from garden collection policies to warrant inclusion in the Appendices. (Copies of the Policy Statement may be obtained from the Field Museum of Natural History,



Chicago, Illinois 60605). Three sections of the Statement have direct bearing on this thesis.

### 1. Background on Collections

This section provides an effective vehicle for explaining the whys and wherefores of the various components of the Museum collections as they had developed prior to the establishment of the Policy Statement. However, the Statement notes that since physical and financial limitations prevent Field Museum from engaging in indiscriminate acquisition, "a schedule of priorities for new accessions must be adopted." Policies covering "deaccession and disposal of specimens or collections...no longer appropriate or necessary for the Museum's area of interest" must also be considered.

### 2. Responsibilities

This section deals with the responsibilities of each specific department to propose guidelines pertaining to the areas of coverage, standards of documentation and accession and deaccession procedures relating to its collection.

To develop a policy regarding the living collections in a botanical garden or arboretum may be difficult; to implement it is even harder. At the Field Museum some of the problems of policy implementation may be alleviated by having individual departments actively participate in its creation. "Admini-

strative review at regular intervals" of the departmental guidelines should ensure that these guidelines are in keeping with the overall Policy Statement.

### 3. Priorities for Accessions

Here the Committee has listed broad categories of accessions according to desired order of acquisition. Their first priority, for example, is to

strengthen collection areas in which the Museum has a current specialization and recognized historical interest, especially when these areas are threatened irreversibly by the activities of man.

Their second priority is "to broaden the comparative base of our established collection areas." And the third, "to obtain collections of a general nature which are within the broad interests of the Museum." Following each priority are examples of items that would fit into each category. "Examples of tertiary priorities are: interesting or unique but inadequately documented specimens that are of limited use in a scientific sense." 2

When carried down to the departmental level these priorities could, I assume, become increasingly detailed, to the point of becoming the rationale for the type of desiderata lists mentioned in the Seattle Art Museum's Accessions Policy.

### Library Collections

The overwhelming problem faced by those charged with the care of library collections is one of space. Naturally they are also concerned with the maintenance and processing of the collections, but the expenditures for these tasks are small when compared to the cost of building new facilities.

Papers, books and articles have been written on the subject of evaluating library collections, many of which are listed as references in Stanley J. Slote's Weeding Library Collections (Libraries Unlimited, Inc., Littleton, Colorado, 1975).<sup>7</sup>

Several of the reasons which Slote notes are traditionally given for not weeding book collections are similar to those given by garden personnel for not weeding living plant collections: large numbers of books are still used as a sign of a quality institution; "Many people consider books to be valuable records of human heritage and therefore almost sacred" thus making the removal of any book painful. Slote says, however, that

Such indiscriminate retention of books does not serve the public. Books that are not being used but that have historical value belong in a depository. A public library that is serving the public needs to have a collection that is up to date and changing.

Although I am not suggesting that plants are necessarily valuable records of human heritage, I do suggest that people tend to avoid discarding plants because of a "sacred" feeling similar to the one Slote mentions.

One other commonly cited reason for not weeding library collections is that this is considered a job for professional librarians. These librarians are supposed to "know" not only "books" but also the needs of the community and are thus in a position to make subjective judgments on the books to be weeded from the collections. Professional work-pressures traditionally have left either little time or have provided a marvellous excuse for not weeding.

In response to this need for professional librarians to do the weeding Slote points out that with the enormous number of new book titles appearing each year it is not possible for librarians to "know books." One way librarians obtain evaluative information on new books is to read reviews; only a very small percentage of new books are reviewed. Another way is for the librarian to read them personally; given the number of hours in each day, this is an impossibility. Therefore Slote advocates the development of a scientific approach to weeding based on the study of use patterns. His basic criteria for keeping or weeding is the "shelf-time period": an estimate or measure of "the length of time a book remains on the shelf

between successive uses."

For libraries with their check-in and -out card systems this approach may prove successful. There is little hope, however, that it could be extended for use in botanic gardens and arboretums where there is no method available to check on public use patterns. Slote notes, however, that librarians must use considerable judgment, experience and professionalism in "determining the acceptable level of use retained by core collections." (The core collections are those that will not be weeded.) He realizes, therefore, that it is not possible to make an exact science out of a weeding system, but "Under the proposed methods, these judgments are limited to judgments of objectives, goals, and services to be given rather than individual titles to be saved or weeded." <sup>7</sup> We also must make judgments and decisions on the objectives, goals and services of each garden and develop our collections policies in the light of these judgments.

I. Pennsylvania Horticultural Society Library

The Pennsylvania Horticultural Society Library, housed in the Society's headquarters in Philadelphia, Pennsylvania, is a good example of an institution that has carefully considered how it can best serve its members in the light of the available finances and library space. In the mid-1960's the Library

Committee proposed to the Council that, in addition to collecting books of current horticultural interest, the Society should focus on an historical book collection related to the development of horticulture in Pennsylvania. One criterion behind this decision was an attempt to avoid collecting the same books as the Hunt Botanical Library in Pittsburgh.

Once the Council had adopted this Policy the Library Committee assembled bibliographies of books they would like to purchase in order to enhance the Pennsylvania Collection. In addition they decided to sell some valuable books that do not fit the guidelines adopted by the Council. Funds from these sales are being used to restore and improve the Pennsylvania Collection.

### CHAPTER III

#### BIBLIOGRAPHICAL NOTES

1. Denver Museum of Natural History. A Description, Statement of Use, and Policies for the Collections of the Denver Museum of Natural History. Compiled by the Collections Policy Committee at the request of Charles T. Crockett, August - November, 1974.
2. Field Museum of Natural History, Chicago, Illinois. Policy Statement on Accessions and Deaccessions, January 30, 1976, 16 pp. Foreword by E. Leland Webber, Director.
3. Homer, William I. Policy Recommendations by the Accessions Committee, Delaware Art Museum, Wilmington, Delaware. November 7, 1974, 3 pp.
4. Lewis, Ralph H. Manual for Museums. Washington, D.C. National Park Service, United States Department of Interior, 1976.
5. Woods, William F., Director, Seattle Art Museum, Seattle, Washington. Seattle Art Museum Accessions Policy, October 28, 1975, 2 pp.
6. Wyrick, Charles, Jr., Director, Delaware Art Museum, Wilmington, Delaware. Personal interview with author, November, 1976.
7. Slote, Stanley, Jr. Weeding Library Collections. Littleton, Colorado: Libraries Unlimited, 1975.

## CHAPTER IV

### DEVELOPING A COLLECTIONS POLICY

#### Introduction

The development of a policy for the living collections in any garden is a very individual affair. There is, however, a logical process, as outlined in the beginning of this Chapter, which personnel in any garden could follow in developing such a policy. The next two sections go on to sketch the development and implementation of such a policy at the Arthur Hoyt Scott Horticultural Foundation, Swarthmore College, Swarthmore, Pennsylvania. The final section of the Chapter is concerned with the implementation of collection policies by other gardens.

#### General Guidelines for Developing Garden Collection Policies

##### I. Original Purposes

A careful study should be made of the pertinent documents (charter, articles of incorporation, etc.) establishing the garden. From this will be determined the original purposes of



the garden.

II. Present-Day Role

Study the original purposes in light of the role the garden plays today:

1. What are its audiences - in order of priority?
2. What are its programs - in order of priority?

III. History of Collection Development

Identify the important plant collections in the garden. Where possible, reconstruct the reasons behind their development. (This exercise will be helpful to those working on the collections policy as well as to garden staff members in future years.)

IV. General Evaluation of the Present Collections

What are the noted strengths?

V. General Evaluation of Strengths of Collections in Nearby Gardens

Outline the important collections in these gardens.

VI. Future Directions

As a result of the above evaluations, which plant groups are seen as being:

1. integral to your collections? (If possible, put them in order of priority.)
2. of less, or no interest to the garden in the light of the reviewed purposes, audiences and programs of the garden?
3. of possible interest to the garden in the foreseeable future? (Here garden personnel should consider new groups that might be incorporated into the garden in the future.)

For each of these groups, staff members should establish a written set of justifications to indicate WHY the group is so evaluated.

VII. Detailed Evaluation of Present Collections

Once a general evaluation of a garden's plant collections has been made, a convenient method must be found to break down this whole into individual parts that can be studied in greater detail. Methods will vary according to the nature of the collections: in some gardens it may be convenient to consider each family separately (as in the Royal Botanic Garden, Edinburgh); in others, horticultural collections (flowering trees, shade trees, or dwarf shrubs for example) may be more appropriate. It is important to find a system by which individual staff members can

take manageable segments to work on as time and expertise permit.

Development of a Policy for the Living Plant Collections at  
the Arthur Hoyt Scott Horticultural Foundation,  
Swarthmore College, Pennsylvania

Mr. Joseph Oppe, Director, Mr. David Melrose, Assistant Director, Ms. Judith Zuk, Educational Coordinator, and Mr. Harry Foulke, Grounds Foreman (henceforward called the Foundation staff), participated in the discussions surrounding this policy. The author's role was similar to that of a consultant.

I. Original Purposes

The purpose of the Foundation was summarized by Dr. John C. Wister, Director, Scott Horticultural Foundation, in 1932, as follows:

The endowment fund for the Arthur Hoyt Scott Horticultural Foundation has been given to Swarthmore College to hold in trust and to use for the encouragement of horticulture in its broadest sense. The founders have wished to make possible a dream of Mr. Scott's to help horticulture by visual demonstration. They have believed that this dream can be best be realized by the planting in a public place of such trees, shrubs, and flowers as can be used by people of average means living in the Philadelphia suburban area. While they wish this planting to be of scientific value, they have no wish to duplicate the work of existing botanic gardens which already cover their field well. Rather they wish this to be a practical

horticultural garden. The term "practical" may here be defined as referring to plants hardy, without special care in the climate of Eastern Pennsylvania, as contrasted with tender exotic plants which cannot be grown or enjoyed by the average person.<sup>3</sup>

## II. Present-Day Role

### 1. The audience

The Foundation staff agreed that its audience is still primarily "people of average means living in the Philadelphia suburban area," who, it hopes, will not only enjoy the plant collections, but also will use them as an educational resource for horticultural and landscaping information and inspiration.

The staff hopes that members of the Swarthmore College community will also enjoy the collections and use them as a horticultural resource. In addition, a segment of this audience requires plants for an undergraduate taxonomy course offered by the Biology Department of the College.

Another sector of the Foundation's audience is personnel in local nurseries who the staff hopes will use the collections as examples of mature specimens in response to customer questions regarding the eventual size and form of plants. In addition, the staff hopes nursery personnel will use the collections as source material for propagation.

## 2. The programs

Traditionally the Foundation has been noted as a display garden. In recent years, however, the garden staff has recognized a commitment to adult education, and plan to make increasing use of its living collections for these programs.

### III. History of Collection Development

From 1930 to 1969 Dr. John C. Wister was Director of the Foundation, for many years ably assisted by Mr. Harry Wood, Superintendent of Buildings and Grounds. During these years the Foundation accessioned over 20,000 plants as Dr. Wister and Mr. Wood sought to develop collections of hardy ornamental plants suitable for use in home gardens in Southeastern Pennsylvania. In keeping with the objectives of the Foundation, they assembled plant collections of superior horticultural value. No attempt was made to assemble collections complete in a botanical sense.

Construction of College buildings has forced the Foundation to move or reduce the size of a few plant collections, and increased maintenance costs have led to the abandonment of several others - mainly those herbaceous perennials, such as iris and chrysanthemum, which require a high degree of hand labor.

The most significant addition to the plant collections since Dr. Wister's retirement has been the Frorer Holly Collection. In 1974, Mr. James R. Frorer, an alumnus of Swarthmore College, offered his collection of hollies, numbering some 450 plants, representing 250 taxa, to the College. At the time the collection was considered one of the finest in the Eastern United States. Following a careful survey of the collection by the Foundation staff and negotiations, Mr. Frorer agreed to pay for the moving of the collection from Wilmington to Swarthmore, and also to provide an endowment for its maintenance. It is important to note here that a policy was established at that time that no significant plant collections would be considered for acceptance by the Foundation unless they carried with them sufficient endowment to provide for their perpetual maintenance.

#### IV. General Evaluation of the Present Collections

The staff believes that the following genera or parts thereof make up the Foundation's most significant plant collections:

<u>Forsythia</u>	<u>Prunus</u> (flowering cherries)
<u>Ilex</u>	<u>Rhododendron</u> (including azaleas)
<u>Magnolia</u>	<u>Syringa</u>
<u>Malus</u> (flowering crabapples)	<u>Wisteria</u>
<u>Paeonia</u> ( <u>suffruticosa</u> )	

V. General Evaluation of Strengths of Collections in Nearby Gardens

The staff of the Foundation defined "nearby" as those gardens within a thirty-mile radius of Swarthmore, the maximum distance the staff believes the average homeowner is willing to travel in order to visit a plant collection.

On pages 80 and 81 these nearby gardens and their major woody plant collections are listed. Basic information for this list was taken from Plants and Gardens, Handbook on American Gardens - A Traveler's Guide.<sup>1</sup> Additional details were gathered from discussions with staff members in several gardens. Since this thesis is only concerned with the woody plant collections at the Foundation, herbaceous and tropical plant collections in other institutions are not included. As this is a general evaluation, it is not appropriate to list the number of plants and number of taxa within each collection. However, the acreage of each garden gives some indication of the extent of the operation. For comparison, the Foundation is located on the 350-acre Swarthmore College campus. Many of these acres are occupied by College buildings.



In several gardens the collections are divided into two sections: generic or family collections, and specialty collections which cover more than one genus but are grouped in the garden as a collection. Both the gardens and the collections are listed in alphabetical order.

<u>Arboretum of the Barnes Foundation, Merion, PA</u>	12 acres
Representative botanical collections primarily for teaching purposes.	
<u>Clark Garden, University of Delaware, Newark, DE</u>	5 acres
Representative horticultural collections used primarily for teaching purposes.	
<u>Henry Foundation for Botanical Research, Gladwyne, PA</u>	27 acres
<u>Ilex</u> , <u>Rhododendron</u> (American azaleas), <u>Styrax</u> species.	
<u>Jenkins Arboretum, Devon, PA</u>	20 acres
<u>Rhododendron</u> (including azaleas).	
<u>Longwood Gardens, Kennett Square, PA</u>	1,200 acres 285 open to public
Generally noted for its horticultural displays, Longwood Gardens lists few woody plant collections. <u>Hamamelis</u> , <u>Ilex</u> , <u>Picea abies</u> cvs., <u>Quercus</u> (test plot for Michaux Quercetum). Dwarf conifers.	
<u>Morris Arboretum, Chestnut Hill, PA</u>	175 acres
<u>Hamamelis</u> , <u>Ilex</u> , <u>Magnolia</u> , <u>Quercus</u> (test plot for Michaux Quercetum), <u>Rhododendron</u> (Glendale azaleas), All -America Rose Garden.	

Swiss Pines, Malvern, PA

20 acres

Dwarf conifers, heather and heath.

Taylor Memorial Arboretum, Wallingford, PA

32 acres

Representative horticultural collections

of genera such as: Acer (Japanese), Camellia,

Cotoneaster, Ilex, Quercus, Rhododendron (azalea).

John J. Tyler Arboretum, Lima, PA

700 acres  
60 developed

Cornus, Ilex, Magnolia, Rhododendron

(excluding azalea), Syringa.

Dwarf conifers

Historical trees

Pinetum (Pinaceae and Cupressaceae, notably

Juniperus)

Shade tree collection in taxonomic order (currently  
in developmental stage).

Westtown School Arboretum, Westtown, PA

7 acres

Mature conifers

Winterthur Gardens, Winterthur, DE

64 acres

Rhododendron (including azalea), Viburnum.

The Awbury Arboretum, Germantown, PA and John Bartram's Garden, Philadelphia, are also within the thirty-mile radius, and have primarily historic, mature plant specimens.

VI. Future Directions (Classification)

In order to study a plant collection so large and complex, and thus hard to evaluate or discuss in general terms, the Foundation staff decided to follow Dr. Wister's 1964 organization of the Foundation's plantings into smaller units of plant families. He divided the families into primary collections, secondary collections, collections abandoned, collections to be abandoned (since the area selected for these collections proved "totally inadequate for so many plants," <sup>4</sup> it was decided to let the good specimens take over and abandon any idea of an educational planting), and vines (these did not fit into the botanical planting sequence established by Dr. Wister and others on the campus).

Initially the staff assigned each family, or genus within a family, to one of five categories of collections:

1. Extensive collections - "E"

These genera are horticulturally well represented at the Foundation and will be maintained as major collections.

In these collections the Foundation will attempt to:

a. maintain those taxa which they would recommend a homeowner plant in Southeastern Pennsylvania. Species will be subjected to the same horticultural selection criteria as other taxa, and will not be maintained unless the staff considers them desirable ornamentally or with special educational value.

b. test new taxa not previously grown in this area for hardiness, disease resistance, landscape value or other qualities. The Foundation hopes to maintain a balance between those plants presently available in nurseries and those it considers of superior horticultural value which it hopes to encourage nurseries to carry.

2. Future collections - "F"

Presently represented at the Foundation, but not considered "E" collections, the staff is considering developing more extensive collections in these genera. Prior to the development of such collections:

a. staff members will visit nearby gardens that indicate strengths in this genus or specialty collection to determine the extent of the present collection and plans for its future development.

b. the reasons for acquiring the collection will be thoroughly documented.

c. the genus will be researched and a list of desired taxa assembled.

The staff will discuss its findings on the above with the Advisory Committee (see p. 91) and receive their approval before embarking on a new collection. Following such approval appropriate authorities on the taxa involved will be consulted.

3. Representative Horticultural - "RH"

These genera are not well represented at the Foundation. The staff is interested in maintaining only a few horticulturally important taxa within each genus. Eventually each genus will be studied to determine if the Foundation holds the taxa considered most appropriate for home owners in Southeastern Pennsylvania.

4. Representative Botanical - "RB"

These genera are not well represented at the Foundation. Although some have ornamental value, they are of interest primarily from a botanical point of view insofar as they are useful for educational programs and the undergraduate taxonomy course offered by the Biology Department of the College. Within each genus the holdings will be small. Should any taxon within these genera die or have to be removed, the Foundation staff shall consult with the Biology Department. If neither the Department nor the Foundation's educational coordinator has need for this taxon it will not be replaced.

5. Native or Naturalized - "N"

These genera are native to the campus woods, or have been naturalized there.

VII. Future Directions (Decisions)

Appendix 13 lists the families in roughly the same order as listed by Dr. Wister in his 1964 report, and indicates the chosen categories for each genus. Those genera considered of primary importance for evaluation are marked with an asterisk.

1. Extensive Collections

It will be noted that the following genera are listed in Appendix 13 as "E" collections:

Forsythia

Paeonia (suffruticosa)

Ilex

Prunus (flowering cherries)

Magnolia

Syringa

Malus (flowering crabapples) Wisteria

With the exception of Rhododendron, the above list includes all the collections rated by the staff on p. 77 as the "genera or parts thereof (that) make up the Foundation's most significant plant collections." Rhododendron was not included because not only is it presently well represented at the John J. Tyler Arboretum (five miles from the Foundation), but Tyler staff members plan to improve and update that collection in upcoming years.

By comparing the list of "E" collections with the collections in nearby gardens it is obvious that the genera Ilex, Syringa and Magnolia are important components of the plant collections in several gardens in Southeastern Pennsylvania. Because of this duplication it is important that the Foundation clearly define its attitude towards its collections of these genera.

a. Ilex

Through the generosity of Mr. James Frorer, this genus currently represents the Foundation's most outstanding collection. By evaluating present holdings and by testing additional taxa the Foundation plans to maintain as complete a horticultural collection of hollies hardy to Southeastern Pennsylvania as is possible. Staff members consider this a contribution to the horticultural world beyond the confines of the Foundation and its audience in Southeastern Pennsylvania.

b. Syringa and Magnolia

Despite the obvious duplication in nearby gardens, the staff believes that collections of these genera should be maintained as "E" collections. From an aesthetic point of view, both collections greatly enhance the College campus. From an historic point of view, lilacs and magnolias were two plants especially favored by Mr. Arthur Hoyt Scott in whose memory the Foundation was established.



This does not mean, however, that the staff intends to preserve the collections in their present state. With 163 plants, representing some 115 taxa, the size of the lilac collection obviously far exceeds that which is necessary to demonstrate to homeowners the best lilacs for planting in Southeastern Pennsylvania. This collection is a prime target for evaluation and probable consequent reduction in size. With the magnolias the situation is less critical, but the staff considers this collection also should be carefully studied.

## 2. Future Collections

### a. Kalmia

Presently, there is no good collection of mountain laurel in Southeastern Pennsylvania. The staff hopes, with the cooperation of Dr. Richard Jaynes, Geneticist, Connecticut Agricultural Experiment Station, to develop a comprehensive collection of the superior types, suitable for culture in the local area.

### b. Viburnum

Because of the work of Dr. Donald R. Egolf, United States National Arboretum, viburnums recently have become increasingly popular as landscape plants and the staff plans to investigate the development of a comprehensive collection of superior hardy taxa.

For both these proposed collections, the Foundation staff will follow the process recommended on p. 83 concerning "F" collections. In the case of the viburnum collection, the initial step will be for the staff to visit Winterthur Gardens, the only nearby garden that lists extensive holdings in this genus, to determine the present and proposed state of this collection.

### 3. Specialty Horticultural Collections

#### a. Dwarf Plant Collection

Recent interest in dwarf and slow-growing plants led the Foundation, in 1970, to establish a small, representative collection of the better types suitable for home gardens. The site selected is small and no consideration was or will be given to developing a large, comprehensive collection. Many nearby gardens emphasize dwarf conifers. The Foundation includes deciduous and evergreen plants in its collection.

#### b. Espalier Collection

Although most of the nearby arboretums and botanic gardens have some espaliered plants, staff members believe that their few examples of this fine, and almost lost, horticultural technique should be augmented. The collection will be small, perhaps no more than ten plants, but will display a variety of taxa and espalier techniques.

c. Street Tree Collection

In 1977 a committee composed of representatives from the City of Bethlehem, Longwood Gardens, Lower Merion Township, Morris Arboretum, Scott Horticultural Foundation, John J. Tyler Arboretum, and Upper Darby Township, under the aegis of the Cooperative Extension Service of the College of Agriculture, The Pennsylvania State University developed a list of trees recommended for planting along streets in Southeastern Pennsylvania. The list is divided into "Primary" and "Secondary" recommendations. The Foundation hopes to plant, under "street-like" conditions all nineteen of the "Primary" recommendations (Appendix 14). The collection will serve tree wardens and others interested in or responsible for street trees in the local area.

Several gardens (Morton Arboretum, Illinois, Royal Botanic Gardens, Ontario, Canada) have assembled or are in the process of assembling (John J. Tyler Arboretum, Pennsylvania) shade tree collections. Although two of these gardens are not within a thirty-mile radius of the Foundation it would be erroneous for the Foundation to duplicate these efforts. To distinguish it from other such collections the Foundation plans to plant the trees in areas closely resembling street conditions. In addition, staff members might set up an efficient system by which they can record data that will be of value to the tree wardens and others who they hope will benefit from this

experiment. Maintenance information (including costs) would be especially helpful and should be recorded from day of planting.

#### 4. Herbaceous Collections

Since herbaceous plants on the College campus are for display rather than educational purposes, the staff has decided that records will not be maintained on these plants. The Foundation will continue, however, to maintain records on the herbaceous plants growing in Dr. and Mrs. Wister's garden. All plants in this garden are considered a part of the Foundation's collections.

Implementation of the Plan for the Living Collections at  
the Scott Horticultural Foundation

At the Foundation administrative authority rests in the hands of the Director who presently reports to two College officers: the Vice President in Charge of Administration and the Director of the Physical Plant. Following Dr. Wister's retirement in 1969 an Advisory Committee, which has considerable influence on Foundation activities since its members are appointed by the President of Swarthmore College was established to assist the Foundation. Thus it is logical that this body should be invited to participate in any decisions regarding the Foundation's plant collections.

In addition to this participation on behalf of the Advisory Committee, the attitude of the Foundation's Director and staff is another key element in policy implementation. This group has expressed great concern for the future of the living collections, and is fully aware that although Swarthmore College is interested in the Foundation's welfare, pressures on the College budget make it imperative that the Foundation operation be efficient. One aspect of efficient operation has to be staff commitment to periodical review of the guiding principles for the development

of the living collections, and a concentrated effort to evaluate the present collection content. To sum up, in the case of the Scott Horticultural Foundation, the Director with assistance from the Advisory Committee is responsible for seeing that the staff implements an effective policy governing the living collections.

The staff of the Foundation plans to discuss the proposed guidelines for the living plant collections with the Foundation Advisory Committee. Should these guidelines be accepted, an interested member of the Advisory Committee could well be asked to join the four staff members mentioned on p. 74 to form a Collections Committee. This group could meet formally twice a year.

Prior to the Collections Committee's first meeting, each staff member might well assume responsibility for one genus from either the "E" or "RH" collections marked with an asterisk in Appendix 13. For the chosen genus the staff member could make an inventory of the plants presently in the collection, noting plant condition and an estimate of its ornamental value. In addition, the staff person should establish a file of material published on the ornamental value of the taxa the Foundation holds within the genus.

At a subsequent meeting each staff member might present a progress report. Following Committee discussions on the state of an individual plant collection, it might be necessary to recruit an outside expert to advise on the appropriateness of staff suggestions for deletions and additions.

Ideally the end result of these discussions would be a master list for the more important collections noting those taxa which should remain in the collection for the foreseeable future, those which should not be replanted if they die, those to be removed as soon as possible, and those to be added to the collection upon the death or removal of other taxa. Naturally it is important that these lists should be kept up to date as staff members come across new research and evaluations done in other gardens.

I. Accessions Policy

Before these master lists can be assembled plants inevitably will be offered to the Foundation from a variety of sources. In order to deal with these donations an Accessions Policy similar to the following, might be adopted:

1. Plants Not Hardy in the Swarthmore Area:

Will not be accepted as part of the Foundation's collections.

## 2. Herbaceous Plants

With the exception of plants for Dr. and Mrs. Wister's garden, this category of plants is only of landscape value to the Foundation and should not be accessioned. All plants for the Wisters' garden will be accessioned in the usual manner.

## 3. Hardy Woody Plants

a. If the Foundation already has the plant in question it should not be accepted unless it is for landscape purposes and shall be so designated in the plant records.

b. If the Foundation does not have the plant it should be assigned to the appropriate category:

"E" - all taxa should be accepted on the understanding that they be evaluated at periodic intervals, and be discarded if they do not fulfill Foundation criteria of a superior ornamental plant suitable for home planting in Southeastern Pennsylvania.

"F" and "RH" - with these groups no plants should be accepted until the limits of the individual collections have been established and desiderata lists assembled for each genus.

"RB" - in this category no plants should be accepted unless expressly requested by the Biology Department or the Foundation educational coordinator and approved by the Collections Committee.



## II. Noting Reasons for Accessions

In future the reason for each plant's accession should be noted on the appropriate record card. These reasons do not have to be elaborate:

E - part of an "E" collection

RH - part of an "RH" collection

L - landscape purposes

EdB - educational purposes - requested by Biology

Department

EdF - educational purposes - requested by the Foundation

(For these purposes the "F" collections do not exist. Plants in these genera would not be accepted unless the staff has decided that the proposed collections should indeed become a part of the Foundation holdings.)

## Implementation of Collection Policies by Other Gardens

The functions of governing bodies, administrative officers and garden personnel in one organization will rarely be the exact equivalent of their counterparts in another organization. Therefore, the measures taken to implement a collections policy must be as individual as the policies themselves. Two general aspects of policy implementation should however, be considered by both board and staff members.

## I. Board Involvement

Since the living plant collections form a very important part of the assets, maintenance operations and programs of most gardens, any plan concerning their development should be considered by the board and therefore rank as a policy decision. Staff and administration will make proposals, but it will be the board who will give the plan the final stamp of approval, and will be responsible for overseeing its implementation in years to come. Assuming that the board of the garden accepts its responsibilities, this explicit expression of intent regarding the living collections, ranked as a policy, should give some continuity to future collection development.

## II. Keeping a Policy Viable

In many institutions time is spent writing elaborate policies which are then left to languish in a filing cabinet. As A.E. Parr says, "Only by daily use in the sense of explicit discussion of their application to daily problems and situations do policies...remain alive and undergo a healthy evolution." <sup>2</sup> Even the most carefully written policy cannot remain viable forever. Board members and administrative staff must be prepared to review and possibly adjust the policy in the light of the current situation. The review process will refresh the minds of those involved as to the original purposes behind the establishment of the institution and encourage more deliberate, careful planning.

## CHAPTER IV

### Bibliographical Notes

1. McGourty, Frederick, Jr., ed. Plants and Gardens, American Gardens: A Traveler's Guide. Revised printing of 26:3.
2. Parr, A.E. Origins, Nature and Purpose of Museum Policy. Curator, V:3 (1962), pp. 217-220.
3. Wister, John C. Bulletin of Swarthmore College, Report on Arthur Hoyt Scott Horticultural Foundation, June 30, 1932. Supplement to Vol.XXX:3 (December, 1932).
4. \_\_\_\_\_, Statement by Director John C. Wister, June 15, 1964. Part II, Details of Present Condition of Collections.

## CHAPTER V

### ARTHUR HOYT SCOTT HORTICULTURAL FOUNDATION EVALUATION OF SELECTED COLLECTIONS

#### Introduction

Unless garden personnel are deeply committed to collection evaluation, a collections policy will be of little use in keeping the plant collections well-tuned to the purposes and needs of an institution. Evaluation is not an easy task, and thus is vulnerable to a trait common in human nature - it is easier to do nothing than to risk a mistake by making a decision. In addition, collection evaluation is similar to cleaning out the attic - as soon as you discard something someone is bound to ask for it. Evaluation mistakes are inevitable, but we cannot afford to let fear of these mistakes paralyze us to the point of inactivity.

When discarding "interesting" plants garden personnel have a responsibility to offer propagation material to "interested" parties in gardens, nurseries, or other horticultural institutions. How to judge interesting plants and interested parties is certainly difficult, and as with the development of a collections policy, each case must be considered separately.

A common excuse for delaying collection evaluation in many gardens is that no member of the small staff has sufficient expertise in a specific area to judge what plants are worth maintaining and which ones should be discarded. Let me insert here a personal note. While studying the Scott Horticultural Foundation's collections I was in a position similar to that which many would encounter in doing the background work on collection evaluation. I have no special expertise on the genera I considered so I had to depend on developing criteria in keeping with the Foundation's purposes, and consulting literature for evaluative judgments. The criteria were chosen by considering both the Foundation's purposes and the special attributes of each genus. The search for evaluative literature from a horticultural point of view was at times very frustrating.

Evaluation of Selected Taxa at the Foundation

Cornus florida, Malus (flowering crabapples), and Magnolia were the three taxa chosen to illustrate the background work necessary in collection evaluation. These taxa were selected for the following reasons:

1. They are well suited as landscape plants for a large portion of the Foundation's audience.
2. The selection criteria vary greatly between taxa.
3. Within each taxon the Foundation holds many species, varieties and cultivars, making the selection process complicated enough to illustrate several problems.

Tables 6, 7 and 9 are examples of the format that was adopted to present these evaluations. In each table all the taxa in the pertinent Foundation collection are listed on the left-hand margin. Following these are two columns entitled "Should the Foundation Replace the Taxon on Death," and "Comments." Under the latter column, rationale for the decision recorded in the first column is noted. A third column cites the appropriate reference(s). It should be noted here that I am recommending gradual replacement rather than instant destruction of undesirable taxa.

Cornus florida

In recent years many new introductions have been made in this species, and as Clarence Lewis says in his introduction to a section on flowering dogwoods in Plants and Gardens' Handbook on Flowering Trees, "How much difference there is among some of the introductions is debatable...."<sup>1</sup>

In view of the nearby John J. Tyler Arboretum's intent to concentrate on this genus, it would seem that the Foundation needs maintain at any one time only sufficient superior cultivars to show the homeowner the range of characteristics available: flower color and doubleness, foliage variation, fruit color and form. Thus it is recommended that the Foundation maintain:

- 2 superior white-bracted cultivars
- 2 " pink-bracted cultivars
- 1 " red-bracted cultivar
- 2 " double-bracted cultivars
- 2 cultivars with variegated foliage
- 1 cultivar with yellow fruits
- 1 cultivar with pendulous form

Table 6 shows the evaluation of the Foundation's collection of twenty-one Cornus florida taxa. It is recommended that ten of these not be replaced on death. A literature search and a careful study of nursery catalogues will reveal taxa to illustrate additional horticultural variations not presently exhibited at the Foundation within this species. Examples of

TABLE 6  
ARTHUR HOYT SCOTT HORTICULTURAL FOUNDATION  
CORNUS FLORIDA EVALUATION

<u>Plant Name</u>	<u>Should Fdn. Replace Taxon on Death</u>	<u>Comments</u>	<u>Ref.</u>
<u>Cornus florida</u>			
<u>white bracts</u>			
cv. Cloud 9	Yes	Superior cultivar)	1,3
Weaver	Yes	Superior cultivar)only two cvs. needed	3
Cherokee		)would depend which	
Princess	Yes	Superior cultivar)died first	2
Barton White	No	Not mentioned as superior cultivar	
Byers White	No	" " " " "	
Hillermeyer	No	" " " " "	
Springtime	No	Superior cvs. available	3
White Cloud	No	Probably the same as cv. Cloud 9	4
<u>pink bracts</u>			
cv. Spring Song	Yes	Superior cultivar	1,3
<u>red bracts</u>			
cv. Cherokee Chief	Yes	Superior cultivar	1,4
Rochester Red	No	Not mentioned as superior cultivar	
Rubra	No	" " " " "	
<u>double bracts</u>			
cv. Mary Ellen	Yes	Superior cultivar	2
Pluribracta	No	Not mentioned as superior cultivar	
<u>variegated foliage</u>			
cv. First Lady	Yes	White, yellow and green - superior cv.	2
Rainbow	Yes	Yellow, pink and green foliage	2
Welchii	No	Sparse bloomer, foliage browns in full sun	2,5
<u>pendulous form</u>			
cv. Pendula	Yes	Only cultivar with this form	
<u>yellow-fruited</u>			
cv. Yellow #7	?	)Only need one yellow-fruited form -	
forma xanthocarpa	?	)evaluate to see which is superior	
cv. Urbana	?	No information available on this cv.	



such taxa are: cv. Fastigiata and cv. Pygmea (variation in plant form and size) and cv. Salicifolia (variation in leaf characteristics).

For landscape purposes several plants of the above and other taxa may be needed. Newly-introduced taxa, on which evaluations must be performed to determine their horticultural value, will also be added.

Malus (flowering crabapples)

In this genus the Foundation maintains some eighty different taxa, making this group the most difficult to evaluate. Best described as a process of elimination, the steps taken in the evaluation of this genus are outlined below.

I. Outline of Evaluation Process

Since I consider disease resistance to be the most important criterion for homeowners to consider in Southeastern Pennsylvania before choosing a flowering crabapple, greatest emphasis was placed on this criterion. Fortunately, Dr. Lester P. Nichols, The Pennsylvania State University, has reported extensive evaluations of disease resistance in crabapples.<sup>8</sup>

As a result of these studies Dr. Nichols has divided the taxa into four lists. List No. 1 (LN-1) contains those with desirable characteristics of plant form, flowering and fruiting which were found to have maximum resistance to diseases most common in flowering crabapples. On List No. 4 (LN-4) are those which Dr. Nichols considers should be discarded because of their extreme susceptibility to one or more diseases. Those taxa on Lists No. 2 and 3 (LN-2 and LN-3) fall between these two extremes. See Appendix 15 for the details of Dr. Nichols' evaluation criteria.

The initial steps in the elimination procedure were as follows:

Under the column "Should the Foundation Replace this Taxon on Death" in Table 7 -

1. A No choice was entered if the plant was:

- on Dr. Nichols' discard list <sup>8</sup> (LN-4 under "Comments").
- on Mr. Wilson Wheelock's Discard List <sup>12</sup> (WW Discard under "Comments," see Appendix 15 for Mr. Wheelock's reasoning).
- not listed in any reference and planted before 1960. (Taxa in this category have been in circulation for at least eighteen years; if they have not been singled out for comment during this time they are probably mediocre. The Foundation is supposed to be growing superior horticultural plants.)
- listed with a negative reference such as "Not highly recommended" (cv. Kingsmere), and "Superior cultivar available" (cv. Gibb).

2. A Yes choice was entered if the plant was:

- not listed in any reference but planted after 1960. (Evaluation needed under "Comments.")

Following these steps I was left with taxa not listed by Dr. Nichols or for which I did not find negative references, and those on his first, second and third lists.

TABLE 7  
ARTHUR HOYT SCOTT HORTICULTURAL FOUNDATION  
MALUS (FLOWERING CRABAPPLES) EVALUATION

<u>Plant Name</u>	<u>Should Fdn. Replace Taxon on Death</u>	<u>Comments</u>	<u>Ref.</u>
<i>Malus angustifolia</i>	No	LN-4*	8
baccata cv. den			
Boer #28	No	No special recommendations	6-14
brevipes	No	LN-4	8
coronaria cv.			
Nieuwlandia	No	LN-4	8,12
cv. American Beauty	Yes	Table 8	
Barbara Ann	No	LN-3, otherwise not listed	8
Beverly	Yes	LN-1, Table 8	8,10
Bob White	No	LN-3, Superior cvs. available for this category	10
Crimson Brilliant	No	LN-4	8,12
Donald Wyman	Yes	LN-2, Table 8	8
Dorothea	Yes	Table 8	
Ellen Gerhart	No	LN-3	8
Frau Luise Ditt-			
man	No	LN-4	8
Gibb	No	Superior cvs. available	6-14
Gladwyne	?	Only listed in 13 - no color infor- mation	6-14
Goldfinch	No	LN-4	8
Henrietta Crosby	No	LN-4	8
Henry F. DuPont	Yes	LN-3, Table 8	
Hillier	No	Superior cvs. available	6-14
Indian Magic	No	Superior cv. available	6-14
Inglis	Yes	LN-2, Table 8	8
Jay Darling	No	LN-4	8,12
Katherine	No	Superior cvs. available	6-14

\* Key

LN-1 Dr. Lester P. Nichols' List No. 1 (maximum disease resistance)  
LN-2 " " " " " No. 2  
LN-3 " " " " " No. 3  
LN-4 " " " " " No. 4 (discard list)<sup>8</sup>

More detailed information appears in Appendix 15

WW Discard - Mr. Wheelock Wilson's discard list<sup>12</sup>  
More detailed information appears in Appendix 15

TABLE 7 (continued)

<u>Plant Name</u>	<u>Should Pcm. Replace Taxon on Death</u>	<u>Comments</u>	<u>Ref.</u>
M. cv. Kibele	Yes	LN-2, Table 8	8
Kingsmere	No	Not highly recommended	13
Lemoinei	No	WW Discard	22
Liset	Yes	LN-2, Table 8	
Makamik	Yes	LN-2, Table 8	
Mary Potter	Yes	LN-2, Table 8	8
Ormiston Roy	Yes	LN-2, Table 8	8
Pink Beauty	Yes	Evaluation Needed	
Pink Perfection	?	Lack of information	
Pink Spires	No	LN-3	8
Prince Georges	No	WW Discard	12
Radiant	?	Discard	12
		Highly recommends	10
Red Tip	No	Category filled with superior cv.	
Royalty	No	LN-3, category filled with superior cv.	8
Selkirk	No	LN-3	8
Simpson 10-27	Yes	LN-1	8
Simpson 10-35	Yes	LN-1	8
Simpson 11-63	Yes	Evaluation needed	
" 14-13	Yes	" "	
" 2-37	Yes	LN-1	8
" 4-28	Yes	LN-1	8
" 8-58	Yes	LN-1	8
Sissipuk	No	Superior cvs. available	6-14
Snowcap	Yes	Evaluation needed	
Snowcloud	No	LN-4	8
Snowdrift	Yes	LN-2, Table 8	10
Spring Snow	No	LN-3	8
Tanner	No	Superior cvs. available	6-14
Timiskanning	No	" " "	6-14
Turesii	Yes	Evaluation needed	
Van Eseltine	Yes	LN-3, Table 8	
Vanguard	No	LN-4	8,12
White Angel (syn. for cv. Inglis)			
William Sim	No	Superior cvs. available	6-14
Winter Gold	Yes	LN-2, Table 8	8

TABLE 7 (continued)

<u>Plant Name</u>	<u>Should Fdn. Replace Taxon on Death</u>	<u>Comments</u>	<u>Ref.</u>
M. floribunda	Yes	LN-2, Table 8	8
halliana	No	Superior cvs. available	6-14
halliana cv. Parkmanni	No	WW Discard	12
halliana var. spontanea	No	Superior cvs. available	6-14
huphensis	Yes	LN-2, Table 8	8
ionensis	No	LN-4	8
lancifolia	No	LN-4	8
platycarpa var. Hoopesii	No	LN-4	8
sargentii	Yes	LN-2, Table 8	8
sargentii cv. Rosea	No	Habit very similar to sp.	6
sieboldii	No	Excelled by many others	6
s. var. zumi cv. Calocarpa	Yes	LN-2, Table 8	6-14
s. cv. Arborescens	No	Not highly recommended	6
spectabilis	No	WW Discard	12
s. cv. Alba-plena	Yes	Table 8	12
s. cv. Riversii	No	Superior cvs. available	8,12
x. cv. Arnoldiana	No	LN-4, WW Discard	12
x. cv. atrosanguinea	No	WW Discard	8
x. micromalus	No	LN-4	8
x. purpurea f. lemoinei	No	LN-4	8,12
x. purpurea var aldenhamensis	No	LN-4	8,12
x. Scheideckerii	No	LN-4	8
x. sublobata	No	No special recommendations	6-14

Disease resistance is however not the only horticultural characteristic of importance to homeowners, and Table 8 was developed to ensure that my recommendations to the Foundation would include taxa to illustrate: the range of flower colors available; single and semi-double or double flowers in all possible colors; a range of fruit colors; the range of available plant forms; and one taxon with red foliage.

1. Flower Color, Single and Semi-Double or Double Flowers

When selecting taxa to give a range of flower colors in both single and semi-double or double flowers those with maximum disease resistance were naturally given first priority. Thus all those listed on Dr. Nichols' first and second lists (LN-1, LN-2) were included in Table 8. There were not, however, taxa on these lists with semi-double or double flowers. Where possible, selections for this characteristic were made from Dr. Nichols' third list (LN-3). This still left only a narrow range of flower colors in semi-double or double flowers. Malus spectabilis cv. Alba-plena (not listed by Dr. Nichols, but for which I did not find negative references) was included as an example of a white, double-flowered cultivar. Malus cv. American Beauty was included as an example of a double-flowered cultivar with carmine buds and flowers, fading to dull pink. In addition, the red foliage of this cultivar illustrates another important horticultural characteristic.

TABLE 8  
ARTHUR HOYT SCOTT HORTICULTURAL FOUNDATION - RECOMMENDED SELECTIONS OF FLOWERING CRABAPPLES

FLOWER COLOR			
White*	Pink*	Pink and White*	Pink Buds, White Fle.* Carmine Buds and Fle., fading to dull pink*, Purplish Red*
<u>Single Flowers</u>			
hupehensis (IN-2) Fruit - Green Form - Fan-shape	cv. Ormiston Roy (IN-2) Fruit - Yellow Form - Rounded	Floribunda (IN-2) Fruit - Yellow/Brown Form - Rounded	cv. Donald Wyman (IN-2) Fruit - Red Form - Rounded
sargentii (IN-2) Fruit - Red Form - Shrubby		cv. Winter Gold (IN-2) Fruit - Red Form - Rounded	cv. Kibele (IN-2) Fruit - Dark Red Form - Shrubby
cv. Snowdrift (IN-2) Fruit - Orange Form - Rounded			cv. Mary Potter (IN-2) Fruit - Red Form - Rounded
			sieboldi var. zumi cv. Calocarpa (IN-2) Fruit - Red Orange Form - Rounded
<u>Semi-double and Double Flowers</u>			
spectabilis cv. Alba-plena Fruit - Yellow Form - Rounded	cv. Henry F. DuPont (IN-3) Fruit - Red Form - Rounded	cv. Dorothea (IN-3) Fruit - Orange/Yellow Form - Rounded	cv. American Beauty Red foliage
	cv. Van Eseltine (IN-3) Fruit - Red/Yellow Form - Upright		

\*Taken from Crab Apples for America by Donald Wyman<sup>13</sup>  
 IN-1 Dr. Lester P. Nichols' List No. 1 (maximum disease resistance)  
 IN-2 " " " " No. 2  
 IN-3 " " " " No. 3  
 More detailed information appears in Appendix 15



## 2. Plant Form

The variation in growth habit among crabapples is well illustrated by four different forms. Below are listed, in alphabetical order, the taxa from Table 8 which illustrate these forms:

- |           |  |
|-----------|--|
| Rounded   | - <u>Malus</u> . cv. American Beauty                     |
|           | <u>M.</u> cv. Donald Wyman                               |
|           | <u>M.</u> cv. Dorothea                                   |
|           | <u>M.</u> <u>floribunda</u>                              |
|           | <u>M.</u> cv. Henry DuPont                               |
|           | <u>M.</u> cv. Liset                                      |
|           | <u>M.</u> cv. Makamik                                    |
|           | <u>M.</u> cv. Mary Potter                                |
|           | <u>M.</u> cv. Ormiston Roy                               |
|           | <u>M.</u> <u>sieboldi</u> var. <u>zumi</u> cv. Calocarpa |
|           | <u>M.</u> cv. Snowdrift                                  |
|           | <u>M.</u> <u>spectabilis</u> cv. Alba-plena              |
|           | <u>M.</u> cv. Winter Gold                                |
| Fan Shape | - <u>M.</u> <u>hupehensis</u>                            |
| Shrubby   | - <u>M.</u> cv. Beverly                                  |
|           | <u>M.</u> cv. Kibele                                     |
|           | <u>M.</u> <u>sargentii</u>                               |
| Upright   | - <u>M.</u> cv. Van Eseltine                             |

All the above taxa were marked Yes on Table 7. Those not listed in any of the available references, for which there was insufficient information, or for which there was a contradiction between references, were marked ?.

### 3. Fruit Color

As can be seen from studying the eighteen taxa in Table 8, a wide range of fruit colors is available to the homeowner in these taxa.

## II. Summary of Results of Flowering Crabapple Evaluation

At this time the Foundation maintains some eighty different taxa of flowering crabapples. Since this collection occupies a large and prominent display area on campus it would hardly be logical to recommend that the staff immediately remove the forty-eight taxa marked No in Table 7. It has been demonstrated, however, that the Foundation can illustrate the most important horticultural characteristics by maintaining only eighteen relatively disease-free taxa. Would it not be advantageous for the Foundation to gradually replace the undesirable taxa with larger numbers of desirable taxa or new taxa to be evaluated? Since a large proportion of the taxa in Table 8 are relatively disease resistant, the Foundation could, by following this course, hold down its maintenance costs for the collection. At the same time it would maintain a magnificent display and perform the desired educational function by exhibiting a wide range of horticultural characteristics.

Magnolia

Since the size range within this genus is considerable and size is an important horticultural criterion, the taxa were initially divided into three categories: 15-30 feet, 30-50 feet, and above 50 feet.

Selection criteria within these categories were as follows:

1. All species should be retained for educational purposes except where cultivars are considered superior.
2. Within Magnolia x soulangiana bloom period and flower color were considered.

Table 9 shows the evaluation of the Foundation's collection, consisting of thirty-three taxa. By considering both the Foundation's purposes and the above criteria it would seem that five of these taxa are redundant and should not be replaced on death. A further five taxa are marked ? since there was insufficient information available on them to make a definite recommendation on their value to the Foundation. Under M. x soulangiana, late bloomer, both cv. Speciosa and cv. Verbanica would serve the same purpose. A similar situation exists in the next category of plants with white flowers.

Further references and suggestions from magnolia

TABLE 9  
ARTHUR HOYT SCOTT HORTICULTURAL FOUNDATION  
MAGNOLIA EVALUATION

<u>Plant Name</u>	<u>Should Form, Replace Taxon on Death</u>	<u>Comments</u>	<u>Ref.</u>
<u>15 - 30 ft.</u>			
Magnolia salicifolia	No	Cultivar superior	17,18.
s. cv. Elise Frye	Yes	Fastigate form, flowers larger and more freely formed than sp.	17,18.
quinquepeta (Lili-flora cv. Nigra)	Yes	Superior to sp. quinquepeta	20
x. soulangiana	Yes	Original hybrid and good bloomer	18.
<u>early bloomer</u>			
cv. Alexandrina	Yes	Early bloom - rose-purple, white inside	16,20
<u>late bloomer</u>			
cv. Speciosa )		Both white - only need to keep one in the collection	16,20
Verbanica )			
<u>white flowers</u>			
cv. Alba )		Only need one white cultivar	17,20
Brozzoni )			
<u>Darkest purple flowers</u>			
cv. Lenei	Yes	Low, spreading growth	17,18,20
<u>Reddest flowers</u>			
cv. Rustica	Yes		17,20
cv. Amabilis	No	Very similar to cv. Alba	17,20
Norbertiana	No	Superior cvs. available	20
Spectabilis	No	Brozzoni considered superior	20
Cylindrica	?	May be a seedling of M. cylindrica	17
Dodd #4	?	No special recommendations	17,20
Lombardy Rose	?	Color similar to cv. Alexandrina - late bloomer	17
San Jose	?	Early bloomer - flower pink	17
stellata	Yes	Species	
stellata cv. Rosea	No	Color fades quickly	20

TABLE 9 (continued)

<u>Plant Name</u>	<u>Should Fdn. Replace Taxon on Death</u>	<u>Comments</u>	<u>Ref.</u>
<u>30 - 50 ft.</u>			
M. grandiflora	Yes	Species	
grandiflora			
cv. Edith Bogue	Yes	Hardy cv.	17
Little Gem	Yes	Narrow habit	17
heptapeta (denu- data)	Yes	Species	
kobus	Yes	Species	
kobus var. bore- alis	No	Like species does not bear until late in life	20
x. loebneri	No	Cultivar is superior	20
x. loebneri cv. Merrill	Yes	Superior cultivar	17
macrophylla	?	Unusual leaf size makes this of limited landscape value for homeowner	
sprengeri cv. Diva	Yes	Only cultivar available at present	
virginiana	Yes	Species	
v. var. australis			
cv. Henry Hicks	Yes	Type tree at Scott Horticultural Fdn.	17
<u>More than 50 ft.</u>			
acuminata	Yes	Species	

specialists may reveal additional taxa to illustrate other horticultural characteristics not presently demonstrated in the Scott Horticultural Foundation's collection.

## CHAPTER V

### Bibliographical Notes

#### Cornus florida

1. Lewis, Clarence, E. "Flowering Dogwoods" in Handbook on Flowering Trees, Plants and Gardens, 19:1 (1967), p. 22.
2. MacDonald, Robert D. Flowering Dogwood. The Floral Magazine, November, 1968.
3. Powell, Thomas and Betty. The Avant Gardener. Boston: Houghton, Mifflin Company, 1975.
4. Smith, Elton, M., and Reisch, Kenneth W. Landscape Trees for Ohio. Cooperative Extension Service, The Ohio State University, Bulletin 597.
5. Wyman, Donald. Trees for American Gardens. New York: The Macmillan Company. 4th printing, 1971.

#### Malus (Flowering Crabapples)

6. den Boer, Arie F. Flowering Crabapples. American Association of Nurserymen, 1959.
7. Kozel, P.C. Superior Trees for Landscaping. (A list - no date).
8. Nichols, Lester P. Disease Resistant Crabapples. The Pennsylvania State University. January 1977 - Pathology Contribution #934.
9. \_\_\_\_\_ and De Wolf, Gordon. New Plants and Old Favorites. Cooperative Extension, Maryland. Nurserymen's Notes. November - December, 1976.
10. Powell, Thomas and Betty. The Avant Gardener. Boston: Houghton Mifflin Company, 1976.

Malus (Flowering Crabapples) - continued

11. United States Department of Agriculture, Agricultural Research Service. History, Progeny, and Locations of Crabapples of Documented Origin. National Arboretum Contribution No. 2, April, 1970.
12. Wilson, Wheelock. An evaluation of flowering crabapples. Men's Garden Club of America. No date.
13. Wyman, Donald. Crab Apples for America. American Association of Botanical Gardens and Arboretums, September 1955.
14. \_\_\_\_\_. "Crab Apples of Merit." Arnoldia: 19:4 (1959), pp. 15-22.
15. \_\_\_\_\_. Trees for American Gardens. New York: The Macmillan Company, 1965.

Magnolia

16. Bailey, Liberty Hyde, Hortus Third. A concise dictionary of plants cultivated in the United States and Canada. Compiled by L.H. Bailey and Ethel Zoe Bailey. Revised and expanded by the staff of the Liberty Hyde Bailey Hortorium. New York: Macmillan, 1976.
17. Fogg, John M., Jr. and McDaniel, Joseph C. Editors. Check List of the Cultivated Magnolias prepared by The American Horticultural Society Plant Sciences Data Center, Mount Vernon, VA 22121, 1975.
18. Journal of the California Horticultural Society. Magnolia Issue, 23:1 (January, 1962).
19. Powell, Thomas and Betty. The Avant Gardener. Boston: Houghton Mifflin Company, 1975.
20. Wyman, Donald. "Magnolias hardy in the Arnold Arboretum." Arnoldia, 20:3-4 (1964).



## CONCLUSION

A botanical garden or arboretum can fulfill several roles in our society: that of providing a serene, attractive oasis amid the harsh, man-made objects which make up much of our present-day environment; that of an educational center where citizens can learn not only the joys of a relatively natural environment but also how their everyday surroundings can be improved; and that of a center where researchers can continue to study plants and their relationship to human beings. Living plant collections are important for the fulfillment of each role, but the increasing financial burden imposed by these collections makes it essential that garden personnel plan them with great care. As I have shown in this thesis, some gardens already have made careful plans and are currently carrying them out. Some gardens have such plans in the developmental stages. Many others, generally not mentioned in this report, do not consider anything beyond a very general plan to be in the best interests of their institutions.

Collection planning involves time, a commitment from the garden board and staff, and a willingness on the part of those in charge to make decisions. When compared to the alternative - the possible dissolution of a garden's collections because they are considered of little value or have become an intolerable financial

burden - these demands seem small. The basic core of a botanical garden or arboretum is still the collections; upon their worth and well-being the research and educational programs depend as well as all efforts to make the garden a force for the social betterment of the whole community.

APPENDIX 1

ARTHUR HOYT SCOTT HORTICULTURAL FOUNDATION

SWARTHMORE, PENNSYLVANIA

DETAILED MAINTENANCE FIGURES

December 1, 1976 - November 30, 1977

Notes:

- Crew Size - 16 groundsman plus grounds foreman  
4 summer student laborers
- Spray Equipment - 30 gallon Hudson (Rose Garden)  
200 gallon Meyers (other areas)
- Pruning - No large tree work - this is contracted out
- Clean-up - Includes litter and leaves
- Fraser Holly  
Collection - Pruning, June 1977. The date of this  
heavy pruning was due to severe winter  
of 1976-77.

APPENDIX I (continued)

Arthur Hoyt Scott  
Horticultural Foundation

	<u>December 1976</u>							<u>January 1977</u>							<u>February 1977</u>						
	Rose Garden	Holly Colln.	Magnolias	Crabapples	Tree Peonies	Gl. Di. Azaleas	Lilacs	Rose Garden	Holly Colln.	Magnolias	Crabapples	Tree Peonies	Gl. Di. Azaleas	Lilacs	Rose Garden	Holly Colln.	Magnolias	Crabapples	Tree Peonies	Gl. Di. Azaleas	Lilacs
Fertilize																					
Mulch																					32
Prune	30	24			16					48	48							48			
Herbicide																					
Cultivate	48																				
Spray																					
Irrigate																					
Transplant																					
New Plants																					
Plant Re- moval																					
Clean-up	24	36			16													16	32		
TOTALS	102	60			32					48	48							16	80		32

\*35 of these hours were worked by student summer crew

APPENDIX I (continued)

Arthur Hoyt Scott  
Horticultural Foundation

	<u>June 1977</u>						<u>July 1977</u>						<u>August 1977</u>								
	Rose Garden	Holly Colln.	Magnolias	Crabapples	Tree Peonies	Gl. Bl. Azaleas	Lilacs	Rose Garden	Holly Colln.	Magnolias	Crabapples	Tree Peonies	Gl. Bl. Azaleas	Lilacs	Rose Garden	Holly Colln.	Magnolias	Crabapples	Tree Peonies	Gl. Bl. Azaleas	Lilacs
Fertilize	8							8	16						8						
Mulch																					
Prune	32	96			60			36			16				32						
Herbicide		24																			
Cultivate	48	38*						48	25*						25*				32		
Spray	16							16			8				16						
Irrigate																					
Transplant																					
New Plants																					
Plant Removal								8			8							16			
Clean-up	12	4	4		8			4	8	8	8				4	12		8			
TOTALS	203	132	4	4	68			133	32	8	24	16			85	12		24	32		
	<u>September 1977</u>						<u>October 1977</u>						<u>November 1977</u>								
Fertilize	8							8													
Mulch																					
Prune	36							8							24	16					
Herbicide																					
Cultivate	48		16					48		32											
Spray																					
Irrigate																					
Transplant																					
New Plants																					
Plant Removal		4																			
Clean-up	4		8	16											24	20		20	48	16	
TOTALS	96	4	8	16	16			64	8	32					48	16	35	20	48	16	
* Hours worked by student summer crew																					
o Wilt Pruf																					

\* Hours worked by student summer crew  
o Wilt Pruf

APPENDIX 2

JOHN J. TYLER ARBORETUM

LIMA, PENNSYLVANIA

DETAILED MAINTENANCE FIGURES

January 1, 1977 - December 30, 1977

Notes:

- Crew size - 3 full-time grounds people
- Clean-up - Includes leaves, litter and brush chipping

APPENDIX 2 (continued)

John J. Tyler  
Arboretum

	<u>January 1977</u>					<u>February 1977</u>					<u>March 1977</u>				
	Rhododendrons	Magnolias	Lilacs	Cherries	Crabapples	Rhododendrons	Magnolias	Lilacs	Cherries	Crabapples	Rhododendrons	Magnolias	Lilacs	Cherries	Crabapples
Fertilize															
Mulch															
Prune				62½	24				110½					16	
Herbicide															
Cultivate/Weed															
Spray															
Irrigate															
Transplant															
New Plants															
Plant Removal															
Clean-up														17	
Label-making															
Mowing											10				
TOTALS				62½	24				110½	10				17	16
	<u>April 1977</u>					<u>May 1977</u>					<u>June 1977</u>				
Fertilize															
Mulch													39		
Prune						23			9½				8		
Herbicide															
Cultivate/Weed						26½			55	31	2½				
Spray															
Irrigate															
Transplant															
New Plants															
Plant Removal				11½						20	5				
Clean-up				37				23	19	24½	14				
Label-making										19					
Mowing	2½	4½	6	19		41	5½	5½	6½	28	53	4	2	36	
TOTALS	2½	4½	6	67½		41	5½	55	6½	51	155½	4	101½	22	38½

	<u>July 1977</u>					<u>August 1977</u>					<u>September 1977</u>				
	Rhododendrons	Magnolias	Lilacs	Cherries	Crabapples	Rhododendrons	Magnolias	Lilacs	Cherries	Crabapples	Rhododendrons	Magnolias	Lilacs	Cherries	Crabapples
Fertilize				6											
Mulch															
Prune	4				1½										
Herbicide															
Cultivate/Weed	26			2½		16½	3	18½		12					
Spray		6	18												
Irrigate															
Transplant															
New Plants															
Plant Removal	7														
Clean-up	32														
Label-making	20½														
Mowing	36	4	10	3½	25	43	5½	7½	8½	21	1½	8½	12	5½	8½
TOTALS	135½	10	28	12	27½	59½	8½	26	8½	33	1½	8½	12	5½	8½
	<u>October 1977</u>					<u>November 1977</u>					<u>December 1977</u>				
Fertilize															
Mulch															
Prune															
Herbicide															
Cultivate/Weed															
Spray															
Irrigate															
Transplant															
New Plants															
Plant Removal															
Clean-up															
Label-making															
Mowing	36	3	3		9½										
TOTALS	36	3	3		9½										



APPENDIX 3

The Use of Record Systems in the Planning of  
Botanic Garden Collections\*

The idea that the collection maintained in a Botanic Garden should be planned is, in general, a relatively recent one. While it is true that certain gardens have, from the outset, had guidelines as to what they should contain (such as plants from distinct politico-geographical regions, eg. Rancho Santa Ana and the South African botanic gardens) it is also true that the collections in the great majority of the European gardens have 'just grown', without any very precise policy for the acquisition and maintenance of stocks. The collections in such gardens have been highly selected; but the selection has been, by and large, outside of the control of those running the garden. Many factors have operated in this selection, some determined by the site of the garden, others more random; the following seem to be the most important:

(a) the range of climates available (i.e. the climate of the site and the provision of glasshouses, etc.)

\* A talk presented by Dr. James Cullen, Assistant Keeper, Royal Botanic Garden, Edinburgh, at a Conference - The Function of Living Plant Collections in Conservation and in Conservation Oriented Research and Public Education - held at Royal Botanic Gardens, Kew, England, 2-6 September, 1975.

(b) the size and efficacy of the staff involved in maintenance;

(c) the nature of the material available, whether from expeditions, the trade, or exchange between gardens;

(d) the ease of propagation of the material available (selection by ease of propagation being a major influence upon what material is widely exchanged between gardens); and

(e) the purpose(s) served by the garden: amenity, research, education and conservation, or any combination from among these four.

Dr. H.R. Fletcher, formerly Regius Keeper of the Royal Botanic Garden, Edinburgh has provided us with a vivid illustration of how this selection operated at its worst. Addressing a meeting celebrating the 150th Anniversary of the Botanic Garden at Geneva (Boissiera 14:57-64, 1969) he discussed the early introduction to European gardens of species from China:

During the last 20 years or so of the last century, considerable amounts of seed were sent to several European gardens, from Western China, by the French missionaries Delavay, Soulie, David and Farges (selection by the collector). The seeds were sown in the usual fashion in the usual composts, and if, and when they germinated the young plants were given hot-house treatment - and most of them promptly died...the gardeners simply treated the seeds and seedlings as they were accustomed to treating seeds and seedlings, and as they thought best (selection by staff expertise).... During the first half of this century pounds and pounds of seeds from the Himalayas were sent to botanic gardens in Britain - mostly to Kew and to Edinburgh - by E.H. Wilson, G. Forrest, F. Kingdon-Ward, R. Farrer, J. Rock, G. Sheriff, F. Ludlow,

George Taylor, and others (again, selection by collector - many of these collectors worked for horticultural syndicates who were interested in novelties and amenity plants). Some of the seed was sown in botanic gardens and some of it distributed from botanic gardens to private gardeners and nurserymen (selection by exchange) - and sown by them....

Profiting from the mistakes of the early sendings of the French missionaries, if and when the seeds germinated, the seedlings were given cooler conditions, and thousands of young plants were raised.... Horticulturalists and gardeners did as they thought best; plants grown from seeds collected from above 11-12000 feet (3350-3650m) were planted out of doors, sometimes in different parts of the garden. Sometimes the plants lived and sometimes they died (selection by climate and staff expertise).

This is certainly a very bleak and perhaps extreme picture of the very unscientific (and unplanned) way in which collections were accumulated, but its general application to the whole range of collection development as it has been carried out heretofore is unquestionable. The net result has been the establishment of the notorious 'standard botanic garden collection' - easily propagated clones or lines of extremely robust, or extremely tolerant species - which forms the backbone, as it were, of the holdings of many gardens.

Such ad hoc, unscientific methods of acquisition and collection management are no longer tolerable; the input of expertise and energy (particularly for material under glass) per plant is too high for us to be able to continue with such a random methodology. In the future, botanic garden collections must be

planned both within and between gardens so that the best use can be made of scarce and diminishing resources. This planning depends entirely on the existence of adequate and accurate records.

The records system at Edinburgh has been comprehensively described elsewhere,\* so I shall abjure any detailed account of it. It is sufficient to say that it provides listings of the gardens holdings arranged alphabetically by genera, by families, by collector (if known), by garden location, and by geographical origin. On the basis of these print-outs a catalogue was prepared, and distributed to most other botanic gardens in 1974. The preparation of such a catalogue is a step that I would like to recommend to other botanic gardens. Even in those cases where the level and standard of identification is low, a catalogue is of considerable help to all research workers. The consolidation of these lists, even though they vary widely in format would be a relatively simple clerical job, and would provide an extremely useful listing of what species are available in cultivation.\*\*

\* Cullen, J. The Living Plant Record System at the Royal Botanic Garden, Edinburgh in Brenan, Ross & Williams (eds). Computers in Botanical Collections, 167-176 (1975).

\*\* Its value would be reduced, though not entirely vitiated, by the varying standards of accuracy of identification.

In order to plan a collection two factors have to be taken into consideration: i) the environmental and staffing constraints; and ii) the purpose or purposes which the garden has. This second factor will vary from organization to organization, but at Edinburgh, as at Kew and many other national or university gardens open to the public and allied to a research institution, is very complex, and may be broken down into several different aspects:

- a) amenity
- b) direct education (the provision of material for classes in botany and horticulture at various levels)
- c) indirect education (material used in making the general public aware of the importance and fascination of plant life)
- d) direct research (provision of material for research in progress in the related institution)
- e) indirect research (the holding of a reservoir of species which can be made available to researchers in various disciplines)
- f) conservation (a relatively recent development).

In any particular garden these different functions will be variously emphasized, and varying priorities will be given to them. Planning must take account of, and indeed, try to harmonize these varying emphases.

At Edinburgh the policy of collection planning has now begun, using the facilities provided by the record system as the basic data. The overall plan is taxonomically based, using families (and to some extent genera) as the working units. These are assessed in terms of the environmental and staffing constraints and the purposes of the garden, as listed above, and each is given a priority level (one of 5 possible levels- see below).

The highest level of priority comprises those families and genera that are required for the purposes of direct research and direct teaching within the garden. Currently, research is being carried out on the Ericales, (Ericaceae, Epacridaceae, Empetraceae and Diapensiaceae), Oesueviaceae (in particular the Old World representatives), Zingiberaceae; Orchidaceae (mainly from SE Asia) primitive woody Dicotyledous and Coniferae as well as on some individual genera from other families. In these cases we are trying to obtain as much material as possible, preferably of wild origin, and to replace stocks of unknown origin by material fully recorded. It may be said that in this category we are still operating the policy of growing everything we can get.

These collections are, or will be, one of the bases for published research, and so will have to be retained after the research itself is completed. It is important that such collections should not be broken up at the conclusion of active research; this is a very long-term commitment. Also included in this category

are species that are used regularly in the teaching programme of the garden mainly classes for the DHE, and in the exhibits available to the public in the Exhibition Hall. All these groups are clearly defined, and present no problems in terms of selection of material.

Problems arise when we consider the functions c) and e) above - the indirect research and education functions. Both of these depend on the garden holding what has often been called 'a general representation of the world's flora' - a difficult concept which I have not seen analyzed anywhere. There has been an unspoken tendency to assume that the mixture produced by the ad hoc methods described at the beginning of this paper was the best approximation possible: this, in fact was often a cover for growing purely amenity material, and certainly cannot stand up to scientific scrutiny.

Under ideal conditions, a 'general representation of the world's flora' might well be a defined proportion (measured generically and specifically) of all taxa; but, of course, circumstances are not ideal, and such a simple measure is impossible. Some of the problems that produce this 'impossibility' are discussed below:

i) Many taxa are simply not obtainable. While it may be possible to ask expeditions to look out for particular species,

there is no great likelihood that suitable propagules may be found. The expedition may well encounter the plant at an unsuitable time for the collection of seeds or cuttings, or, if potentially suitable cutting material is present, the area in which it is found may be so remote that it is impossible to transmit the material in time for adequate rooting. Even if suitable material is received at the garden, there is no guarantee that mature plants will result.

ii) Many species, though obtainable from time to time are impossible or extremely difficult to grow; many of the parasitic and saprophytic species fall into this category, as well as species whose growth requirements (climatic, edaphic or ecological) are difficult to reproduce. In a large, general collection, such plants are not worth the effort that must be put into their growing; but perhaps in smaller collections, or where there is a research interest in them, the extra effort can be applied, and successful cultivation can be the result.\*

iii) A large number of species raise particular problems due to their size and climatic requirements. The large rain forest trees of the tropics fall into this category: no botanic garden in temperate regions can hold a comprehensive collection of,

\* Yeo, C.F., The Growth of Euphrasia in Cultivation.  
Watsonia 6:1-24 (1964).



for example, Dipterocarpaceae. The same applies to a great deal of the purely tropical flora; glasshouse space is usually restricted, and imposes very severe limitations on the variety of species that can be grown.

iv). A problem of a rather different nature is raised by the lack of knowledge of the propagation and culture techniques required by many species. The horticultural literature covers only a highly selected and very limited range of plants, and the accuracy and efficiency of many of the procedures recommended is, to say the least, dubious. More research is an obvious answer to such problems; but because of economic considerations, and the lack of suitably trained staff to undertake it, such research seems unlikely to be carried out. However, over the years, garden staffs have developed reasonably successful techniques of propagation and cultivation for many species. These, unfortunately are rarely published and are passed on as a hidden oral tradition; many procedures die with their inventor, and are lost. To prevent this happening, growers must be encouraged to annotate their records with observations on cultural techniques, even at the simplest level; this information can then be stored, made available to others and considered critically, as and when suitably trained staff are available.

The way we try to define 'a general representation of the world's flora' has to take all these factors into account. Clearly the level of representation regarded as adequate for a purely tropical family will be lower than that for a temperate one; similar considerations apply to purely aquatic families, and others with a narrow range of ecological tolerance.

In trying to decide on levels of representation a number of particular problems present themselves:

- i) What taxonomic rank should be the basic unit?
- ii) How can the level considered adequate be related to the size of the group in the wild?

At Edinburgh we have used the number of genera in the family as the working level; though not ideal, this is a convenient measure. The representation of species within the genera is a matter for further discussion. The relationship between the number of genera thought to give an adequate representation and the number of genera in the family is a complex one, not susceptible to precise definition. In the larger families (ie those with more than 20 genera) we have considered 10% of the genera to be an adequate representation for temperate families, and 4% for tropical or otherwise difficult families. For smaller families the figure rises to a theoretical 100% for monogeneric families, whether tropical or temperate.

On this basis the families can be sorted into the priority levels mentioned previously:

a) The highest level, consisting of those families already discussed, or which we wish to achieve the highest level of representation possible.

b) The second level, consisting of families of which we require a better than adequate representation. These comprise:  
a) families related to those in the highest priority level, which may become important as research progresses; b) families already well represented in the existing collection, for which expertise and suitable climatic conditions are already available; and  
c) families which may well be used in direct research at Edinburgh in the future.

c) The third level, comprising those families which we regard as requiring an adequate level of representation - of no direct research interest but able to be grown in sufficient numbers.

d) The fourth level, comprising families of which we can hold only a token representation - again of no direct research interest, and unsuitable for large scale culture in Edinburgh. Many of the tropical woody families are included here.

e) The lowest level, consisting of families that are impossible or extremely difficult to represent at all: parasites, saprophytes, and other difficult cases.

Some examples for levels 2-5 (level 1 has already been discussed above) may serve to illustrate the use of these levels.

Level 2

Dilleniaceae - considered by some workers to be related to the Ericales.

Betulaceae - although not directly related to the primitive woody Dicotyledons, this Amentiferous group (and others) may have some bearing on the same problems.

Primulaceae - already well represented in the collection, and, at least in part intensively studied at Edinburgh in the past.

Level 3

Caryophyllaceae, Leguminosae, Rubiaceae, Campanulaceae.

Level 4

Dipterocarpaceae, Meliaceae, Velloiaceae.

Level 5

Rafflesiaceae, Podostemaceae, Triuridaceae.

It must be emphasized that these levels are only guidelines to be interpreted flexibly rather than rigidly. Even so, they do provide guidance as to what material is acceptable, and as to how resources should be allocated.

There still remain problems of generic and specific representation. Having decided, say, that we require a 10% level of representation of the genera of the Rubiaceae, further guidance is required as to which genera these should be, and which species of these genera should be used. There are many varying problems like this, and we have decided to deal with them by means of small committees of both scientific and horticultural staff looking at the holding of particular groups. A number of these groups are now at work, on the Conifers, Palms, Orchidaceae, Betulaceae, and others will be set up in the future. These groups make decisions on what genera should be included in the collection and what species should represent them, bearing in mind the guidelines mentioned above, the availability of material, and the morphological and geographical range of the groups under consideration.

So far, I have not discussed the aspect of amenity, mentioned earlier as a function of a botanic garden open to the public. In general, it is possible to grow the plants which have been acquired under a planned policy in a way which is usually attractive, and displays the individual specimens, to best effect. Some plantings, such as shelter belts, may have to be of species which are selected purely because of their ability to grow in the particular site where they are needed, rather than because of their specific importance in a planned collection; but these are

necessary for the successful growing of other plants, and therefore cannot be said to be pure amenity plantings. Another possibility is to consider certain parts of the garden as purely amenity areas, such as bedding schemes around buildings, or heather gardens, etc. The total separation of amenity plantings from the broadly scientific collections is, however, not altogether a good thing (even though intensively worked collections may have to be segregated for some time), because by adopting it, we lose the opportunity for public education by stealth. In the pleasant, well-laid-out surroundings of a botanic garden, the public is, on the whole in a receptive mood; by careful planting and discreet labelling, certain important ideas can be presented:

- i) the importance of plant life to human societies;
- ii) the practical need for conservation;
- iii) the range of plant life suitable for small, domestic gardens;
- iv) the types of garden treatment suitable for difficult sites - around buildings, walls, etc.

This kind of planning will enable us to develop the collection in a rational way, and to use resources of all kinds to better effect. A similar kind of planning on a national or international scale is a further desirable development. As mentioned earlier, however, such planning is only possible for

gardens which have an adequate record system: planning on an international scale requires some form of agreement on compatibility of at least the basics of record systems. This could perhaps come about as a result of this conference.

APPENDIX 4  
Royal Botanic Gardens, Edinburgh  
Present and Desired Generic Representation in Living Plant Collections

Family	No. of genera & spp.	No. of g. & s. in garden	Recon. generic %	% in garden	Comments on generic representation
Casuarinaceae	1/50	1/4	100	100	Adequate
Myricaceae	3/56	1/4	33-66	33	Just adequate; acquire <u>Comptonia</u>
Juglandaceae	8/58	3/13	9-30	37	Good representation
Balanopaceae	1/9	0	100	0	Try to obtain
Leitneriaceae	1/1	0	100	0	Try to obtain
Salicaceae	2/350	2/106	50-100	100	Good representation
Betulaceae	6/100	6/50	12-36	100	Excellent representation
Fagaceae	7/600	7/79	8-25	100	Excellent representation
Rhoiptaloaceae	1/1	0	100	0	Try to obtain
Ulmaceae	15/150	3/17	8-25	20	Adequate
Eucommiaceae	1/1	1/1	100	100	Good
Moraceae	61/1550	10/51	6-20	16	Adequate; acquire a few more
Urticaceae	42/700	11/25	7-20	25	Good
Protocneae	62/1400	13/31	6-20	20	Adequate
Olacaceae	27/230	0	8-32	0	Parasites, difficult. Acquire?
Dipentodontaceae	1/1	0	100	0	Chinese, difficult to get, little known
Opiliaceae	7/60	0	10-32	0	Tropical, some parasites. Acquire?
Grubbiaceae	1/5	0	100	0	Cape: ? related Ericales? Acquire
Santalaceae	35/400	2/2	7-20	6	Poor; ? parasites; difficult to increase holding
Loranthaceae	40/400	1/1	7-20	2	Poor; parasites; difficult
Miscodendraceae	1/11	0	100	0	Parasites; difficult
Balanophoraceae	18/100	0	8-25	0	Parasites; difficult
Medusandraceae	2/6	0	50-100	0	Tropical trees; difficult
Polygonaceae	40/800	10/74	7-20	25	Good
Phytolaccaceae	17/120	6/8	8-25	33	Good
Gyrostemonaceae	5/16	0	20-40	0	Australian; acquire
Aclatocarpaceae	2/8	0	50-100	0	American: split of Phytolaccaceae: unimportant
Nyctaginaceae	30/300	3/4	7-22	10	Low: try to increase?
Molluginaceae	14/95	0	8-35	0	Cosmop: mostly annual: perhaps we have <u>Hypertelis</u>
Aizoaceae	131/2500	50/216	5-15	38	Good
Portulacaceae	19/500	7/26	8-25	35	Good
Basellaceae	5/20	1/1	20-40	20	Adequate (just), but unimportant
Caryophyllaceae	80/2000	15/116	6-18	20	Split of Chenopods. Unimportant.
Dynophaniaceae	1/6	0	100	0	Barely adequate; increase.
Chenopodiaceae	100/1500	7/10	5-26	7	Barely adequate; increase
Amaranthaceae	60/900	4/4	6-20	6	Surprisingly adequate
Didiereaceae	4/11	2/4	25-50	50	Good to excellent
Cactaceae	170/2000	75/270	5-15	40	



## APPENDIX 4 (continued)

	16/300	10/49	8-35	60	Excellent	
(Winteraceae etc						
(Magnoliaceae	1/1	0	100	0	Difficult to acquire, but important	
Degeneriaceae	1/3	0	100	0	Difficult to acquire, but important	
Himantandraceae	120/2100	2/2	5-15	2	Poor; important to increase holding	
Annonaceae	1/2	0	100	0	Difficult to acquire, but important	
Eupomatiaceae	15/250	1/1	8-25	7	Acquire more	
Myrsinaceae	6/20	0	10-40	0	Acquire	
Caneliaceae	1/2	0	100	0	Difficult; important	
Austrobaileyanaceae	2/7	0	50-100	0	Difficult; important	
Trimeniaceae	1/1	0	100	0	Difficult; important	
Amborellaceae	34/450	6/7	7-20	16	1 Subf. poorly covered; try to obtain	
Monimiaceae	2/9	2/4	50-100	100	Good	
Calycanthaceae	1/1	0	100	0	Difficult; important	
Gonortegaceae	31/2250	12/22	7-20	40	Good	
Lauraceae	3/4	3/4	33-66	100	Excellent	
Trochodendraceae	1/2	1/2	100	100	Excellent	
Cercidiphyllaceae	4/65	0	25-75	0	Difficult; important	
Hernandiaceae	47/2000	23/316	7-20	50	Excellent	related to 'primitive
Ranunculaceae	14/650	13/168	8-25	90	Excellent	
Barberridaceae	9/31	7/9	9-30	85	Excellent	woody Dicots.; very
Lardizaballaceae	67/425	7/8	6-20	10	Barely adequate; increase?	
Menispermaceae	8/80	7/23	9-40	90	Excellent	adequate collection
Nymphaeaceae	4/5	2/2	25-75	50	Good	
Saururaceae	10/1400	2/56	8-35	20	Adequate	
Piperaceae	5/70	1/1	20-40	20	Barely adequate; increase; vesselless!	
Chloranthaceae	1/1	0	100	0	Almost impossible to get	
Lactoridaceae	7/600	2/20	10-32	28	Adequate	
Aristolochiaceae	9/55	0	9-30	0	Parasites: impossible?	
Rafflesiaceae	2/18	0	50-100	0	Parasites: impossible?	
Hydnoraceae	10/350	2/3	8-30	20	Adequate; could increase	
Dilleniaceae	1/30	1/7	100	100	Excellent	
Paeoniaceae	1/4	1/1	100	100	Excellent	
Crocosomataceae	1/5	1/5	100	100	Excellent	
Eucryphiaceae	28/400	4/5	7-22	14	Adequate	
Ochnaceae	3/3	0	33-66	0	Interesting but difficult to get	
Dioncophyllaceae	1/1	0	100	0	Difficult to obtain	
Strasburgeriaceae	22/400	1/1	8-22	5	Poor, but large tropical trees	
Dipterocarpaceae	35/600	6/29	7-22	13	Adequate	
Theaceae	2/25	0	50-100	0	Interesting but not particularly important	
Caryocaraceae	5/120	1/1	20-40	20	Just adequate	
Maro-graviaceae						

All are "primitive"

woody Dicots. in

which we have

special interest;

important to have

better than adequate

holding of these

related to 'primitive

woody Dicots.'; very

adequate collection

APPENDIX 4 (CONTINUED)

Quilacae	3/37	0/0	33-66	0	Not particularly important
Guttiferae	49/900	6/44	7-20	12	Adequate
Ancistrocladaceae	1/16	0	100	0	Not particularly important but of interest
Sarracenaceae	3/16	3/2	33-66	100	Excellent
Nepenthaceae	1/79	1/14	100	100	Excellent
Droseraceae	4/93	?	?	?	Not on P.O. Interesting
Papaveraceae	47/700	15/66	7-20	30	Good
Capparidaceae	46/800	2/4	7-20	4	Poor: must increase
Cruciferae	350/3000	37/114	4-15	11	Adequate: some interesting genera could be acquired
Touratiaceae	1/2	0	100	0	Easy to obtain: should do so
Resedaceae	6/70	1/1	12-38	16	Barly adequate: some interesting and easy to get
Moringaceae	1/10	0	100	0	Obtainable: not particularly important
Bataceae	1/2	0	100	0	Hard to get and grow (maritime)
Platanaceae	1/7	1/5	100	100	Excellent
Hamamelidaceae	26/115	16/27	8-22	60	Very good: important 'primitive woody Dicots'
Myrothamnaceae	1/2	0	100	0	? Unobtainable
Crassulaceae	30/1400	26/432	8-22	80	Excellent: do we need so many?
Cephalotaceae	1/1	?	100	?	Do we have this? Not on P.O.
Saxifragaceae	80/1200	39/338	6-20	50	Excellent
Brunelliaceae	1/35	0	100	0	Hard to get: no particular importance
Cunoniaceae	25/350	3/4	8-22	12	Adequate
Davidsoniaceae	1/1	0	100	0	Unimportant split of Cunoniaceae
Pittosporaceae	9/240	4/20	9-30	40	Excellent
Byblidaceae	1/2	0	100	0	Difficult? Importance?
Roridulaceae	1/2	0	100	0	Difficult? Importance?
Burseraceae	12/75	0	8-25	0	A largish family to be unrepresented
Rosaceae	100/3000	65/722	5-18	65	Excellent
Chrysobalanaceae	12/300	0	8-25	0	A largish family to be unrepresented
Connaraceae	24/400	0	8-32	0	A largish family to be unrepresented
Leguminosae	60/13000	94/274	3-11	16	Adequate: Caesalpinioideae poor
Hydrostachyaceae	1/30	0	100	0	Impossible?
Podostemaceae	43/200	0	7-20	0	Impossible?
Limnanthaceae	2/8	1/1	50-100	50	Adequate
Oxalidaceae	8/950	2/15	9-30	25	Adequate
Geraniaceae	11/780	4/78	8-28	35	Good
Tropaeolaceae	2/80	1/4	50-100	50	Adequate
Zygophyllaceae	30/250	4/4	7-22	12	Just adequate
Linaceae	25/500	1/10	8-22	4	Poor: some other genera should be obtained
Erythroxylaceae	4/200	?	25-75	?	Do we still have <u>Erythroxylum</u> ?
Euphorbiaceae	290/7500	27/120	4-15	10	Just adequate
Rutaceae	150/1600	31/59	5-18	20	Adequate to good

APPENDIX 4 (continued)

	2/3	?	50-100	?	Do we still have Oneorun?
Oneoraceae	2/3	4/6	8-22	16	Adequate
Simarubaceae	24/100	0	100	0	Importance?
Pterodendraceae	1/3	1/2	8-24	5	Poor: acquire a few more
Bursaceae	20/600	7/11	7-20	14	Adequate
Maliaceae	50/1400	0	100	0	Importance?
Akniaceae	1/1	4/8	6-18	6	Barely adequate
Malpighiaceae	63/800	0	25-75	0	Importance?
Trigonaceae	4/35	?	12-38	?	Important to have one: do we have any?
Vochysiaceae	6/200	0	33-66	0	Importance?
Tremandraceae	3/30	0	8-26	7	Poor: acquire other genera than Polysala
Polygalaceae	13/800	1/4	100	100	Good
Coriariaceae	1/10	11/20	6-18	12	Adequate (?): could add here
Anacardiaceae	79/600	2/60	50-100	100	Excellent
Aceraceae	2/150	0	100	0	Importance?
Bretchneldraceae	1/1	14/18	5-16	10	Adequate
Sapindaceae	140/1500	1/11	50-100	50	Adequate
Hippocastanaceae	2/15	1/5	25-75	25	Just adequate
Sabiaceae	4/90	2/3	33-66	66	Adequate
Melanthaceae	33/38	0	100	0	Importance?
Asteraceae	1/1	1/22	50-100	50	Adequate
Balanaceae	2/450	0	50-100	0	Importance?; may have one
Julianaceae	2/5	0	33-66	0	aff. Ericales? Acquire
Cyrtillaceae	3/14	0	100	0	Importance?
Pentaphyllaceae	1/4	1/22	33-66	33	Adequate
Aquifoliaceae	3/450	1/1	100	100	Good
Corynocarpaceae	1/5	0	100	0	Difficult: importance?
Pandaceae	1/1	10/48	6-20	16	Adequate
Calantracae	60/850	1/4	10-32	13	Poor to just adequate; odd?
Staphyleaceae	7/50	1/1	8-24	5	Poor, but tropical, hard to get
Hippocrateaceae	18/300	0	33-66	0	Acquire one (Australian)
Stackhouseaceae	3/22	0	33-66	0	Importance?
Salvadoraceae	3/12	0	13-38	50	Good
Buraceae	6/60	3/15	7-20	3	Poor, but tropical, hard to get
Iconiaceae	45/400	1/2	100	0	Importance?
Cardiopteridaceae	1/3	0	6-20	20	Adequate
Rhamnaceae	58/900	11/34	8-25	45	Good
Vitaceae	13/770	6/44	8-25	50	Good
Elaeocarpaceae	10/400	5/10	9-30	0	Madagascan endemics: importance?
Sarcocaulaceae	8/33	0	7-20	14	Adequate
Tiliaceae	45/400	6/23	5-18	25	Good
Malvaceae	85/1500	23/68			

## APPENDIX 4 (continued)

Bombacaceae	28/200	3/6	7-22	11	Just adequate
Sterculiaceae	7/1000	9/15	6-18	13	Adequate
Scytopetalaceae	5/32	0	20-40	0	Importance?
Geisolomataceae	1/1	0	100	0	Importance?
Pentaceae	5/21	0	20-40	0	Importance?
Dichapetalaceae	4/250	0	25-75	0	Rather large unrepresented family
Thymelaeaceae	48/650	8/23	7-20	16	Adequate
Elaeagnaceae	3/65	3/9	33-66	100	Good
Flacourtiaceae	86/1300	10/13	5-18	14	Adequate (spread may not be good)
Peridiscaceae	2/2	0	50-100	0	Difficult; importance?
Violaceae	16/850	4/36	8-25	25	Adequate
Stachyuraceae	1/6	1/2	100	100	Good
Scyphostegiaceae	1/1	0	100	0	Impossible
Turneraceae	8/120	0	9-30	0	Should acquire at least <u>Turnera</u>
Malvaceae	1/25	0	100	0	Difficult; importance?
Pasifloraceae	12/600	3/22	8-25	25	Adequate
Achariaceae	3/3	1/1	33-66	33	Adequate
Cistaceae	8/175	6/41	9-30	66	Excellent
Bixaceae	1/1	1/1	100	100	Good
Sphaerocarpaceae	2/14	0	50-100	0	Difficult; importance?
Cochlospermaceae	2/20	1/1	50-100	50	Adequate
Tamaricaceae	4/100	1/1	25-75	25	Barely adequate
Frankeniaceae	4/50	1/2	25-75	25	Barely adequate
Elatinaceae	2/45	0	50-100	0	Importance?
Caricaceae	4/45	1/3	25-75	25	Adequate
Loasaceae	15/250	1/1	8-25	7	Poor; increase
Datisacaceae	3/4	2/2	33-66	66	Good
Begoniaceae	5/820	2/103	20-40	40	Adequate
Cucurbitaceae	100/850	5/9	5-18	20	Adequate
Lythraceae	22/500	6/14	8-22	25	Good
Trapaceae	1/1	0	100	0	Aquatic; importance?
Crypteroniaceae	1/4	0	100	0	Importance? Often in Saxifragaceae s.l.
Myrtaceae	100/3000	23/104	5-18	23	Good
Dialypetalanthaceae	1/1	0	100	0	Importance? Has been in Loganiaceae
Sonneratiaceae	2/7	0	50-100	0	Mangroves
Punicaceae	1/2	?	100	?	Do we have this?
Lecythidaceae	24/450	2/3	8-22	8	Adequate
Melastomataceae	200/4000	24/44	5-15	12	Adequate
Rhizophoraceae	16/120	0	8-22	0	Mangroves
Combretaceae	18/500	3/7	8-24	16	Adequate
Onagraceae	20/650	7/43	8-24	37	Good



Family	3/4	0	33-66	0	Parasites: Ericales? Possible to grow?
Lennaceae	100/2600	14/43	5-18	14	Adequate
Verbenaceae	1/25	1/1	100	100	Adequate
Callitrichaceae	200/3200	55/256	5-18	25	Good: research interest; increase?
Labiales	2/83	1/1	50-100	50	Adequate
Nolanaeae	85/2300	23/60	5-18	26	Good
Duckeodendraceae	1/1	0	100	0	Importance?
Scrophulariaceae	200/3000	54/302	5-18	25	Good
Globulariaceae	2/27	1/7	50-100	50	Adequate
Bignoniaceae	120/800	24/39	5-18	20	Adequate
Henriqueziaceae	1/7	0	100	0	Importance?
Acanthaceae	250/2600	46/130	4-15	20	Adequate-Good
Pedaliaceae	16/55	0	8-25	0	A large family to be unrepresented; acquire
Nartyniaceae	5/16	0	20-40	0	Acquire
Gesneriaceae	140/1800	56/318	5-18	31	Good; are there more unrecorded?
Columelliaceae	1/4	0	100	0	Importance? Split of Gesners.
Orbanchaceae	13/150	0	8-25	0	Parasites
Lentibulariaceae	5/300	1/3	20-40	20	Figures probably wrong
Nyoporaceae	5/180	1/4	20-40	20	Adequate
Phytaceae	1/1	0	100	0	Acquire? Importance?
Plantaginaceae	3/265	1/9	33-66	33	Adequate; non-ornamental
Caprifoliaceae	15/400	12/165	8-25	80	Excellent
Adoxaceae	1/1	0	100	0	Easy to acquire
Valerianaceae	13/360	5/12	8-25	35	Good
Dipsacaceae	10/270	7/17	8-25	70	Excellent
Cucurbitaceae	70/2000	22/140	6-18	28	Good
Sphenocleaceae	1/2	0	100	0	Importance?
Pentaphragmataceae	1/25	1/25	100	0	Importance?
Goodeniaceae	14/320	1/1	8-25	7	Poor: increase
Brunoniaceae	1/1	0	100	0	Acquire?
Stylidiaceae	6/140	1/2	12-38	16	Just adequate
Calyceraceae	6/60	0	10-38	0	Rather large for no representation
Compositae	920/19000	134/591	2-10	12	Good
Alismaceae	10/70	5/27	8-25	50	Good
Butomaceae	4/13	2/2	25-50	25	Adequate
Hydrocharitaceae	15/100	5/8	8-25	25	Adequate
Scheuchzeriaceae	1/2	1/2	100	100	Good
Aponogetonaceae	1/40	1/11	100	100	Good
Juncaginaceae	4/18	0	25-50	0	Importance?
Potamogetonaceae	5/105	1/4	20-40	20	Just adequate



APPENDIX 5

FAIRCHILD TROPICAL GARDENS

CORAL GABLES, FLORIDA

April, 1975

Criteria for Making Plant Accessions, Essentially  
Perennial Ornamental and Botanical Species  
at the Fairchild Tropical Garden

1. Does the species\* come from a locality or environment indicating that it may be grown and established at the Garden or in the area?
2. Does the species have some general or special recognized merit?
3. Is the species a new addition to the Garden or to the area?
4. Is the species of some particular interest to a staff member at the Garden or to a cooperating institution, or desired for some specific reason such as study, addition to plantings or distribution to members?
5. Is the species without a known objectionable characteristic?

\*Footnote - The term "species" also covers varieties, clones, races and forms.



If the answers to questions 1 to 5 inclusive are "yes" the species should be accepted.

As complete identification as possible of the accession is desirable - (1) scientific name, (2) genus, (3) family, (4) common or vernacular name.

To be acceptable without identification it must be accompanied by notes helpful for identifying, growing or appraising it.

If the answer to question 5 is "no" but to questions 1 to 4 is "yes" a decision to accept or reject is called for and should be made by the Director of the Garden or his designate.

A "no" answer to any of questions 1 to 4 warrants a rejection unless question 4 has been answered "yes."

If answers to questions 1 to 5 inclusive are "no" the species should be rejected.

Special consideration should be given to accepting species of the Palm and Cycad families.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.



# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.



# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.



# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.



# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.



# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.

# ***Error***

---

An error occurred while processing this page. See the system log for more details.