NON-DEGREE PROFESSIONAL GARDENER TRAINING PROGRAMS IN NORTH AMERICA

By

James Andrew Mack

A thesis submitted to the Faculty of the University of Delaware in partial fulfillment of the requirements for the degree of Master of Science in Public Horticulture Administration

August 1988

Copyright 1988

ACKNOWLEDGEMENTS

I would like to thank the Longwood Graduate Program in Public Horticulture Administration for the graduate fellowship that has made the preparation of this thesis possible. Appreciation also goes out to my thesis committee for their help and guidance in preparing the initial and final drafts of my manuscript: Jim Swasey; Jim Flynn; and Dave Scheid.

I would also like to thank Dave Foresman, Coordinator, Resident Student Programs, Longwood Gardens; Jeannie Fernsworth, Coordinator, Student Services, and Rosemary Kern, Director of Education and the School of Horticulture, The New York Botanical Garden; and Bill Snowden, Superintendent of the Niagara Parks Commission's School of Horticulture for their help in assisting me in accurately appraising their student programs. Special thanks goes to all of those individuals and institutions that responded to my survey concerning gardener training.

I would also like to acknowledge my family and friends for all of their love and support. Last, but certainly not least, I would like to thank my wife, Mary, and my son, Ian, for all of their love, support, and especially for their patience and understanding throughout the term of my fellowship, and during the preparation of this thesis. You are great friends, loving companions, and a continuous source of inspiration. I am indebted to you both for believing in me.

TABLE OF CONTENTS

Page

LIST OF TABLES.....viii

LIST OF FIGURES.....x

ABSTRACT.....xii

INTRODUCTION.....1

Chapter

I. NEEDS ASSESSMENT SURVEY.....5

A. "Horticulturist" versus "Gardener".....5
B. Methodology.....6
C. Analysis of Survey Results.....11
1. Administrators, Supervisors, and Gardeners.....11
2. Botanical Gardens, Arboreta, Zoological Gardens, and Theme Parks.....12
3. Geographic Hardiness Zones.....12
4. Total Employees and Full-Time Gardeners.....14
5. Annual Operating Budget.....16
6. Gardener Hiring Policies.....16
7. Gardener Qualifications.....18
8. Assignment of Gardeners.....20
9. Horticultural Expertise of Gardeners..21
10. Gardening Skills.....21
11. Future Gardener Positions.....39
12. In-Service Training Programs.....40
13. Basic Mangement Skills.....43
14. Additional Issues.....46

II. PROFESSIONAL GARDENER TRAINING PROGRAMS.....48

A. Overview.....49

B. Program Differences.....50

1. Academic Requirements.....61
2. Practical Field Requirements.....71

III. RECOMMENDATIONS FOR PROFESSIONAL GARDENER TRAINING PROGRAMS.....77

APPENDIX A: Public Institutions Selected for the Survey 83

APPENDIX B: My Survey Definition of a "Gardener".....92

APPENDIX C: Sample Letter Sent to "Administrators".....93

APPENDIX D: Gardener Study Questionnaire (Administrator).....95

APPENDIX E: Sample Letter Sent to "Supervisors".....100

APPENDIX F: Gardener Study Questionnaire (Supervisor).102

APPENDIX G: Sample Letter Sent to "Gardeners".....106

APPENDIX H: Gardener Study Questionnaire (Gardener)...108

APPENDIX I: Sample Follow-up Post Card.....112

APPENDIX J: Required Course Listing and Course Descriptions of Longwood Gardens' Professional Gardener Training Program.....114

APPENDIX K: Required Course Listing and Course Descriptions of The Niagara Parks Commission's School of Horticulture.....120

APPENDIX L: Required Course Listing and Course Descriptions of The New York Botanical Garden's School of Horticulture.....128

APPENDIX M: Professional Gardener Training Program Comparisons.....135

TABLES: A-1 through A-18.....158

SOURCES CONSULTED.....183

LIST OF TABLES

Table A-1. Number of full-time employees.....159

Table A-2. Number of full-time gardeners.....160

Table A-3. Annual operating budget.....161

Table A-4. Policy for hiring gardeners, or, current level of training and experience.....162

Table A-5. "Other" levels of training or experience required, or, "other" levels of training or experience.....163

Table A-6. Percentages of administrators, supervisors, and gardeners that believe gardener qualifications have significantly changed over the last decade.....164

Table A-7. Ways gardener qualifications have changed in the past decade.....165

Table A-8. Gardener work assignments.....167

Table A-9. Level of horticultural expertise entry-level gardeners brought to their instituions.....168

Table A-10. Degree of skill importance for gardeners.....169

Table A-11. Anticipated gardener positions to fill within next five years.....172

Table A-12. Percentage of public institutions that provide in-service training for employees.....173

Table A-13. Description of current in-service training programs.....174

Table A-14. Provisions for future in-service training programs in the next five years....175

Table A-15. Description of future in-service training programs.....176

Table A-16. Ranking of skills important for "Supervisors".....177

Table A-17. Top three supervisory skills of importance for "Gardeners".....179

Table A-18. Additional issues concerning gardener qualifications and training.....181

LIST OF FIGURES

Figure 1. Total number of full-time gardeners.....15

Figure 2. Annual operating budgets.....17

Figure 3. Belief that qualifications of gardeners have changed significantly over the past ten years.....19

Figure 4. Identification, selection and care of annuals and herbaceous perennials.....22

Figure 5. Identification, selection and care of trees, shrubs, and vines.....23

Figure 6. Selection, handling, and use of pesticides 25

Figure 7. Selection, handling and use of fertilizers 26

Figure 8. Handling, use and general care of hand tools.....28

Figure 9. Proper pruning techniques.....30

Figure 10. Soil preparation, amendment, and testing 32

Figure 11. Site mapping, surveying, and drafting...33

Figure 12. Management of time.....34

Figure 13. Preparation of budgets and forecasting of costs.....35

Figure 14. Effective communication (oral and written) with colleagues and the public.....37

Figure 15. Ability to supervise and motivate others 44

Figure 16. Ability to effectively manage time.....45

ABSTRACT

The qualifications desired of gardeners have changed since the last survey of botanical gardens and arboreta in 1971 (Hodyss). The results of a survey that I administered of public institutions that employ gardeners revealed that a majority of administrators, supervisors, and gardeners believe that some skills which were important over a decade ago (i.e., turf establishment and maintenance, and plant propagation) are now less important; while others (i.e., handling and care of small power equipment and the identification, selection, and care of ornamental plants) have increased.

From the standpoint of gardener training programs, however, a more important change has occurred in the interest public institutions are showing basic management skills for gardeners. Once solely the domain of supervisory personnel, skills like: communication with colleagues and the public, project organization and implementation, and time management are now desired, if not required, by many institutions of the gardeners they

currently employ, or will employ in the future. Gardeners that can supervise other gardeners and volunteers, coordinate basic plant installation projects, and give talks to interested visitors and local garden societies are now preferred by many public institutions over gardeners that do not have these professional skills.

Non-degree granting professional gardener training programs provide students with practical field experience and classroom training in a wide range of horticultural areas. The programs that most effectively prepare gardeners for careers in public horticulture combine both horticultural training and basic management experiences. I have provided, as a portion of this document, an appendice which compares three such gardener training programs.

Although the primary focus of my research is on gardener needs of public, not-for-profit institutions, many of my findings validly apply to private and commercial horticultural establishments, as well. This information is useful in writing job descriptions for gardeners, designing horticultural in-service training programs, and evaluating the abilities of staff gardeners.

A useful training model, based upon the results of my survey, includes the following elements for professional gardener training programs:

* better structuring of practical and in-class periods to take advantage of outdoor weather conducive for hands-on experience

* mandatory oral and written communication assignments to encourage communication skills

* a minimum of three years of training, with the third year concentrating on basic management issues

* student options for three-month internships to other horticultural institutions

* stipends and on-site housing for students

INTRODUCTION

The goals of my thesis research are:

* to determine the values administrators, supervisors, and gardeners of public institutions place on horticultural and basic management skills for gardeners

* to examine and compare selected professional gardener training programs in North America

* to determine how well these programs are preparing their students for employment in public institutions

* to make recommendations for program improvements

Throughout this paper, I have defined a professional "gardener" to mean "an individual who is supervised by a first-line supervisor (i.e., foreman, section-head) and is responsible for the routine planting and maintenance activities of assigned or general areas in a public botanical garden, arboretum, zoological garden, or other public institution that grows, exhibits, and maintains plants for purposes of education, aesthetics, enjoyment, or recreation" (see Appendix B). The word "professional" is used to differentiate gardeners that

are employed vocationally, from those that garden for pleasure.

Opinions on gardener training methodologies are as varied as the programs themselves. Hodyss stated that gardener training programs

> must be narrow enough so that time is not spent on irrelevant information, yet, broad enough so that individual specialization in any of the areas felt important will be possible. (Hodyss 1971, 3)

Although many colleges and universities offer students a wide choice of horticultural degree options, my research is focused on programs that offer aspiring professional gardeners horticultural training on the diploma or certificate levels. As such, training programs that offer associate or baccalaureate degrees in horticulture were excluded from the study.

The professional gardener training programs I chose to study were:

* The Longwood Gardens' Professional Gardener Training Program, Longwood Gardens, Kennett Square, Pennsylvania

* The Niagara Parks Commission's School of Horticulture Program, Niagara Parks Commission, Niagara Falls, Ontario, Canada

* The New York Botanical Garden's School of Horticulture Diploma in Horticulture Program,

The New York Botanical Garden, Bronx, New York

Other non-degree programs in North America that offer horticultural training are excluded from consideration for two reasons:

1) training emphasizes work in private, for-profit horticulture rather than in public, not-for-profit horticulture, (i.e., the DuPage School of Horticulture, West Chicago, Illinois, trains students for the commercial floriculture and nursery management industries)

2) training is too limited and specialized to enable constructive program comparisons (i.e, The Pacific Tropical Botanical Garden, Lawai, Kauai, Hawaii, offers a nine-month training program in tropical horticulture)

My survey revealed that a significant number of horticultural skills which Hodyss' (1971) survey of botanical gardens and arboreta termed "most highly rated" are now somewhat less important for gardeners. Turf establishment and maintenance, and plant propagation are considered to be significantly less important for gardeners today than these same skills were just over a decade ago. Conversely, effective communication with colleagues and the public, a skill that was "least highly rated" in 1971 (Hodyss), is today significantly more desirable for gardeners.

An important trend has surfaced in public institutions over the past decade regarding the qualifications of gardeners. Administrators and supervisors more frequently desire gardeners who not only have sound horticultural expertise, but who also have some basic management ability, as well. Many public institutions now desire, if not require, time management, project organization and implementation, and oral and written communication skills of the gardeners they employ.

This trend towards gardener training in basic management has ramifications for in-service training programs, as well. The kinds of skills that gardeners need to compete successfully within public institutions are the same skills gardeners already employed within these institutions can benefit from today. By incorporating basic management training into currently administered horticultural skills training programs, employees can immediately benefit and contribute more effectively to their institutions. Professional gardener training programs will need to incorporate more management experiences into their programs if they are to effectively provide student gardeners with the tools they will need in public horticulture.

CHAPTER I

NEEDS ASSESSMENT SURVEY

A. "Horticulturist" versus "Gardener"

"Horticulturist" and "Gardener" are words often used to describe persons who are engaged in the care of gardens, whether professionally as an occupation, or recreationally as a hobby. The words are not synonymous, however, and need clarification for the purpose of my research.

According to William Snowden, Coordinator of the Niagara Parks Commission's School of Horticulture, and George Armstrong, Principal Scientific Officer for Amenity Horticulture, Royal Botanic Garden, Edinburgh, Scotland, "gardeners" are persons who know how to perform any number of horticultural tasks, but do not necessarily know why they are performing them. "Horticulturists", on the other hand, know both "how" and "why" to perform them (personal interviews, 6 April 1987, and 1 June 1987, respectively).

Throughout this paper, I use the word "gardener" in place of "horticulturist" for the following reasons:

1) many botanical gardens, arboreta, and other public institutions that employ "horticulturists" most often refer to them as "gardeners"

2) gardener training programs administered by botanical gardens, arboreta, and other public institutions most often refer to their students and alumni as "gardeners", not "horticulturists"

3) my survey specifies "gardener" in place of "horticulturist" to avoid any confusion which might have occurred had both terms been used

B. Methodology

A needs assessment survey of selected botanical gardens, arboreta, zoological gardens, and theme parks (e.g., Colonial Williamsburg, Williamsburg, Virginia) was administered from September to November, 1987. I used the following criteria to determine which public institutions to include in my survey:

* institutions were to be located in North America

* institutions were to be open and accessible to the public and employ staff "gardeners" according to my definition (see Appendix B)

* institutions were to be large enough to employ three distinct personnel levels: "administrators" (e.g., directors, superintendents), "supervisors" (e.g., foremen, section-heads), and "gardeners" (e.g., groundskeepers)

With these criteria, and the input from several professionals in the field of public horticulture, seventy-four institutions were chosen for the survey. Of the total number of institutions chosen, six (8.1%) are theme parks, nine (12.2%) are zoological gardens, and fifty-nine (79.7%) are botanical gardens or arboreta (see Appendix A).

Representation from administrators, supervisors, and gardeners of these institutions is desirable to:

* assess the effectiveness of professional gardener training programs in training their students for employment in public horticulture

* obtain a truer picture about how public institutions feel about gardener qualifications

Furthermore, representation from all three levels is useful, not only in making more accurate recommendations for improvements to professional gardener training programs, but also in helping administrators and supervisors to recognize areas of importance for inclusion or deletion from current or planned in-service training programs.

Administering the survey to various personnel levels, however, presented me with a challenging

logistical problem. How could I select the most representative person for each level? This problem was handled by identifying and targeting "administrators," only, of each institution surveyed. They (administrators) were given instructions to deliver the "supervisor" and "gardener" surveys to the individual they felt best represented a supervisor at their institution (see Appendix C). Similarly, supervisors were instructed to deliver the "gardener" survey to their most representative gardener (see Appendix E). By choosing to administer the survey in this manner, I feel that I saved time and increased distribution efficiency.

All surveys were color-coded according to the personnel levels targeted. Self-addressed stamped envelopes and cover letters that included a promise of survey results for all cooperating institutions were included for all surveys mailed as a packet to administrators. In all likelihood, promising participants the results of the survey directly enhanced survey response rates (Dillman 1978, 171).

Follow-up postcards (see Appendix I) were mailed to all institutions two weeks after the surveys were distributed. I made telephone contact with those

institutions that had not responded by the stated closing date of October 15, 1987; several institutions that had not responded up to that point did so shortly thereafter. All surveys that are included in the final analysis were received by early November, 1987.

My survey was designed to gauge how administrators, supervisors, and gardeners feel about gardener qualifications. All surveys (see Appendices D, F, and H) included several "core" questions for a direct comparison of the skills administrators, supervisors, and gardeners believe are important for gardeners. In addition, administrators were asked several specific questions which revealed useful demographical information about each institution (see Appendix D, questions 1-3). These questions provided information on each institution's:

* total number of employees
* total number of full-time gardeners
* annual operating budget

Each institution's geographic hardiness zone was determined by their physical location on a "Hardiness Zones of the United States and Canada" map, produced by the Arnold Arboretum, Harvard University, Jamaica Plain,

Massachusetts (1971).

Among the core questions appearing on all surveys, administrators, supervisors, and gardeners were asked whether the overall qualifications expected of gardeners had changed over the past ten years (see Figure 3.). They were also asked to rate, and in some cases to rank, both horticultural and basic management skills they believe are desirable for the gardeners their institutions employ.

Many of the skills that Hodyss' survey (1971) concluded were "most highly rated" for gardeners (as solicited from both public and private horticultural institutions) are included in my needs assessment survey:

* plant propagation techniques
* pruning of trees and shrubs
* turf establishment and maintenance
* landscape design
* preparation of soil
* use of chemicals and equipment for disease, insect, and weed control

By including the skills which were important for gardeners over a decade ago, I was able to make valid assumptions concerning changes in gardener qualifications during that period of time.

To test my belief that gardeners today are expected to have some basic management ability in addition to horticultural expertise, several supervisory-associated skills are included in the surveys. Among the basic management concepts explored were:

* preparation of budgets and forecasting of costs
* project management and supervision
* effective communication (oral and written) with colleagues and the public
* management of time

C. Analysis of Survey Results

A total of 222 surveys were distributed to administrators, supervisors, and gardeners of seventy-four public botanical gardens, arboreta, zoological gardens, and theme parks.

1. Administrators, Supervisors, and Gardeners

Among administrators, supervisors, and gardeners that responded, response rates were comparatively consistent. Fifty-nine "administrators" (79.7%), fifty-five "supervisors" (74.3%) and fifty-five "gardeners" (74.3%) completed and returned the survey, for an overall rate of return in excess of seventy-five percent (76.1%).

2. Botanical Gardens, Arboreta, Zoological Gardens, and Theme Parks

Nine out of nine zoos; five out of six theme parks; and forty-six out of fifty-nine botanical gardens and arboreta actively participated in my survey. A total of sixty out of seventy-four institutions responded, for a return of over eighty percent (81.1%).

3. Geographic Hardiness Zones

Geographic locations for each institution are derived from the "Hardiness Zones of the United States and Canada" map (Arnold Arboretum, 1971). Gardens from various hardiness zones are desirable; they enable comparisons to be made between the types of skills desired of gardeners from different climatic regions.

Thirty-six responding institutions reside in the warmer zones of 7, 8, 9 and 10, and have average annual minimum temperatures of 5 degrees to 40 degrees Fahrenheit. Of these, twenty-nine (80.6%) believe that on a scale of 1 to 3 (1 = "critical", 2 = "desirable" and 3 = "not important") the following skills are "critical" for gardeners:

* identification and care of turfgrass

* selection, handling, and use of fertilizers
* handling, use, and general care of hand tools
* handling, use, and general care of small power equipment
* proper pruning techniques

In all likelihood, longer growing seasons may make these skills more important for gardeners as compared with some of the other skills listed in my survey.

In contrast, respondents from the cooler zones of 1, 2 and 3 (average annual minimum average temperatures of -50 degrees to -20 degrees Fahrenheit) and 4, 5 and 6 (average annual minimum temperatures of -20 degrees to 5 degrees Fahrenheit) feel most strongly about:

* interpretation of landscape drawings
* and familiarity with botanical and horticultural literature

It is quite possible that cooler regions place a higher value on these kinds of skills due to their colder climates and shorter growing seasons. More staff time may be available in these regions for independent plant and design research during the winter months. Thirty-six institutions are located in these regions; twenty-eight (77.8%) responded to the survey.

4. Total Employees and Full-Time Gardeners

Almost seventy percent (69.5%) of the public institutions that responded employ between zero and seventy-four full-time employees (see Table A-1.). Slightly more than seventy percent (71.2%) employ from zero to fourteen full-time gardeners (see Figure 1. and Table A-2.) compared with seventy-four percent in 1971 (Hodyss).

A rather conservative growth pattern is evident from my survey based on the static number of full-time gardeners employed in public horticulture since 1971. Though this fact says very little about gardener turnover rates in public institutions, it does point out that these institutions are making do with essentially the same number of gardeners they had over sixteen years ago. While the reasons are not readily discernable, I believe from my own personal experience with interviewing selected staff members of Longwood Gardens (for the purpose of reevaluating their job descriptions), that other public institutions may also be striving to accomplish the same if not more work with virtually the same number of gardeners.

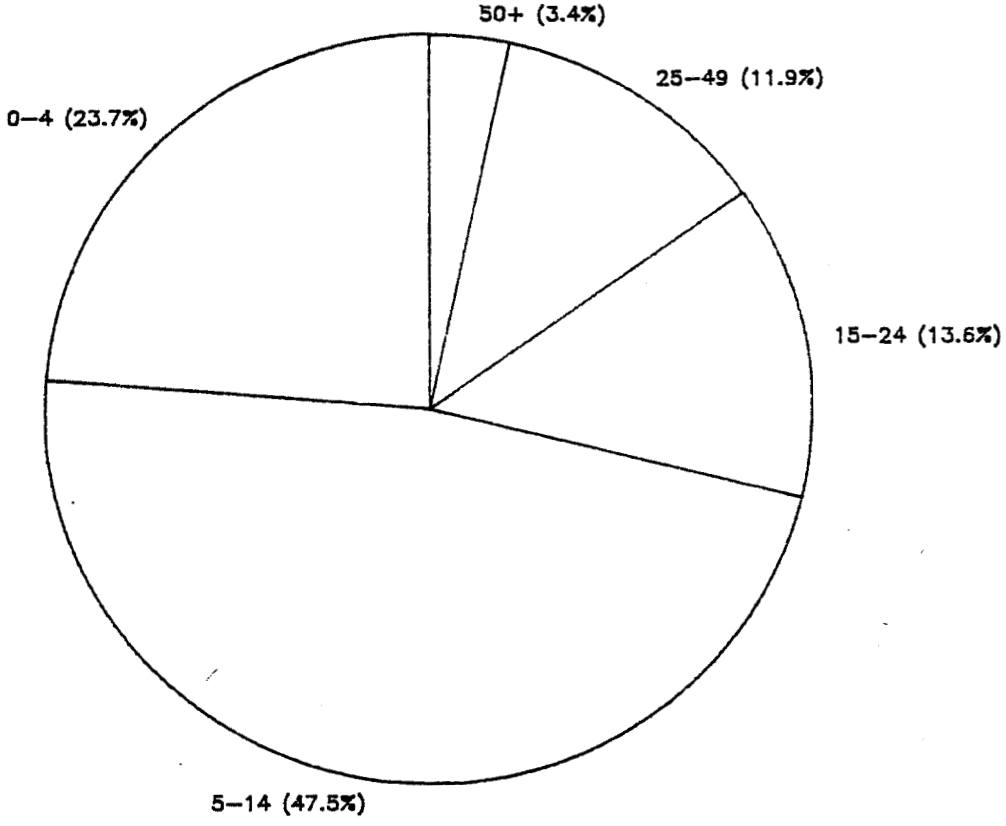

Figure 1. Total number of full-time gardeners. Taken from survey of administrators of public institutions.

Assuming this is true, then either:

* gardeners are becoming more efficient at a particular task

* or gardeners are more highly trained to perform a greater variety of horticultural tasks.

I believe the latter to be true; better training usually results in increased efficiency.

5. Annual Operating Budget

Annual operating budgets may be determining factors in how much money is available for administrators to staff public gardens. Budgets are also likely to affect the calibre of gardener that public institutions are able to affordably employ. Surprisingly, over two thirds of the responding institutions have annual operating budgets of one million dollars or more (see Figure 2.). Furthermore, only slightly more than 10% have annual budgets of $500,000 or less (see Table A-3.). It appears that I may have underestimated the budgets of public institutions when I formulated the survey budget ranges.

6. Gardener Hiring Policies

As evident from Table A-4, administrators prefer to hire gardeners with either (or both):

* some mixture of formal education and on-the-job experience
* an associate's degree in horticulture or a closely allied field

From Table A-5, gardeners currently have either (or both):

* some mixture of formal education and on-the-job experience

* baccalaureate degrees in horticulture or closely allied field

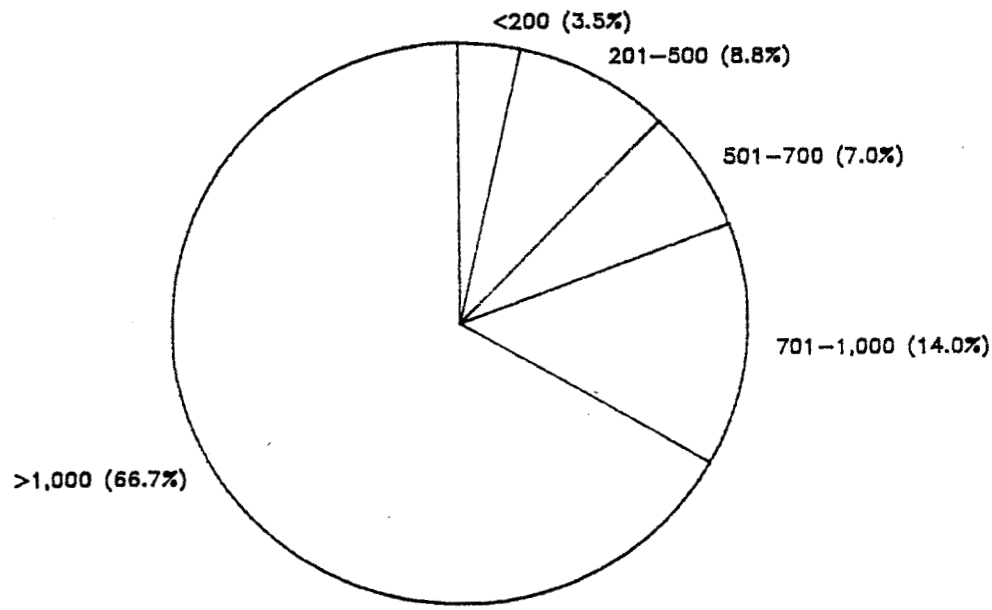

Figure 2. Annual operating budgets. Taken from survey of administrators of public institutions.

It is apparent that gardeners are presently meeting, if not exceeding the entry-level standards required of public institutions. Due to a rather static rate of growth in gardener positions since 1971, competition for virtually the same number of horticultural positions is not only keen, but is coming from a more highly trained pool of gardeners.

7. Gardener Qualifications

Over sixty percent (62.8%) of the responding administrators, supervisors, and gardeners believe that gardener qualifications have changed significantly over the past ten years (see Figure 3. and Table A-6.).
It is interesting to note that only six respondents believe that the overall qualifications of gardeners have decreased over the same period (see Table A-7, code # 6). Clearly, a trend towards preferring, and in some cases requiring, more highly trained gardeners is evident. From my survey, this trend is not only apparent, but specific skill preferences for gardeners have been identified. These include (in order of preference):

* more advanced technical and academic training to supplement practical on-the-job experience
* more highly trained gardeners as a result of a better educated public

* stricter environmental regulations (i.e., pesticide legislation)

* knowledge of horticulturally associated skills (i.e., a) the ability to supervise volunteers, interns, and fellow staff members b) the ability to communicate horticultural knowledge to staff and the public, and c) the ability to hold workshops, to lecture, and to

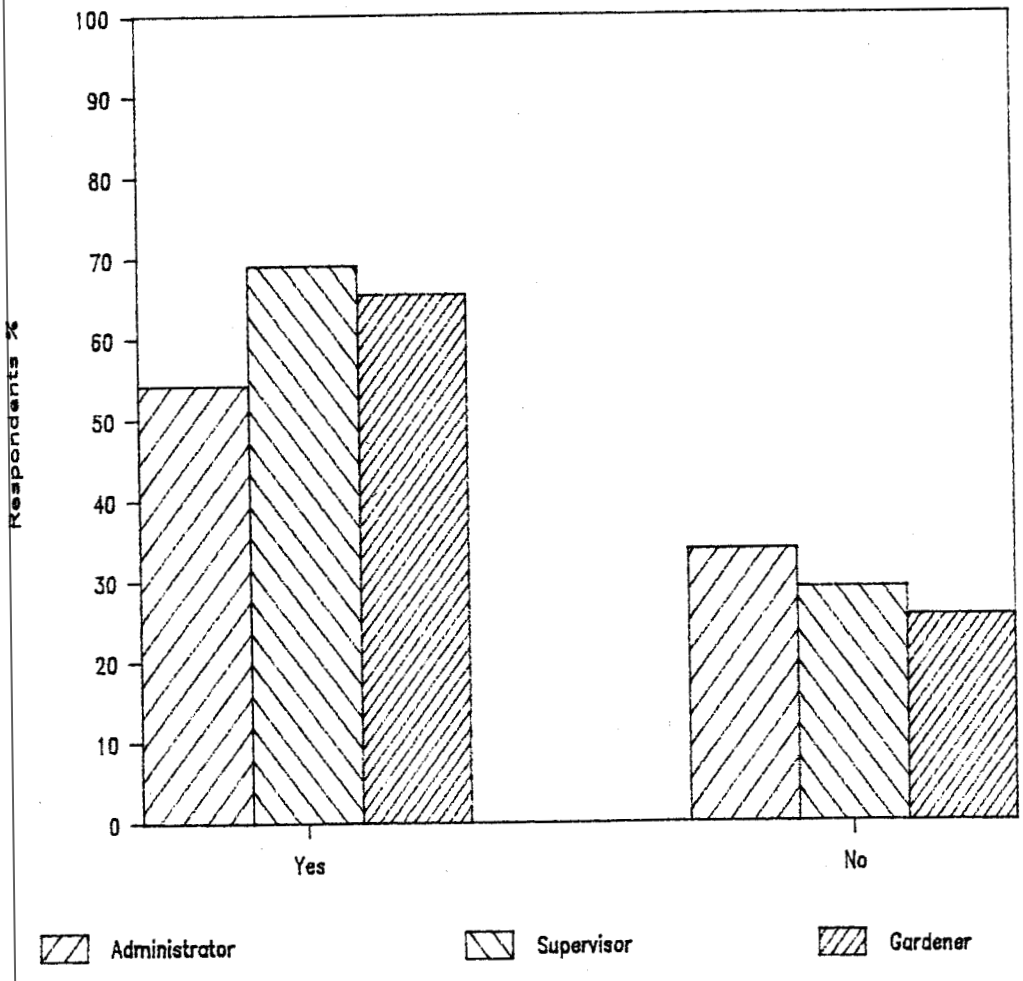

Figure 3. Belief that qualifications of gardeners have changed significantly over the past ten years. Taken from survey of administrators, supervisors, and gardeners of public institutions.

write horticultural articles [see Table A-7, codes 1, 2 and 3])

Indicative of this need for more highly trained gardeners is the response from eleven survey participants that an "overall upgrading in status for the gardener, from common laborer to skilled professional" has occurred over the last decade (my survey response, 1987 [see Table A-7, code #7]).

8. Assignment of Gardeners

Whereas Hodyss' (1971) survey reported that a majority of botanic gardens and arboreta assigned gardeners to areas where they were needed at the time, my survey indicates that most gardeners today are assigned to specific garden areas (see Table A-8.).

This change in gardener assignment is significant. It suggests that public institutions prefer gardeners who are able to perform a wider variety of horticultural operations. While some will argue that specific gardener assignments do not guarantee that gardeners have a wider range of horticultural know-how, I believe that specific garden assignments not only require gardeners to have a better grasp of the more highly specialized skills within

their garden areas, but in all likelihood requires them to have some expertise with any number of horticultural tasks associate with these areas.

9. Horticultural Expertise of Gardeners

As shown in Table A-9., gardeners at public institutions are competent to perform most general horticultural practices. While this says little about specific gardener skills, it does suggest a preference for gardeners with a diversity of horticultural ability. Expertise of this nature is commonly acquired by combining formal academic study with some practical work experience. This approach forms the basis of professional gardener training programs, which I discuss in Chapter II.

10. Gardening Skills

Administrators, supervisors, and gardeners believe that identification, selection, and care of annuals, herbaceous perennials, trees, shrubs, and vines (see Figures 4. and 5.) are "desirable" to "critical" gardener skills. Interestingly enough, gardeners feel that both skills are more often "critical", and less often "desirable" than either administrators or supervisors (see Table A-10, skills a and b).

The reason for this discrepancy is not clear. I observed that gardeners, as a group, feel stronger about all of the skills listed on Table A-10 as compared to

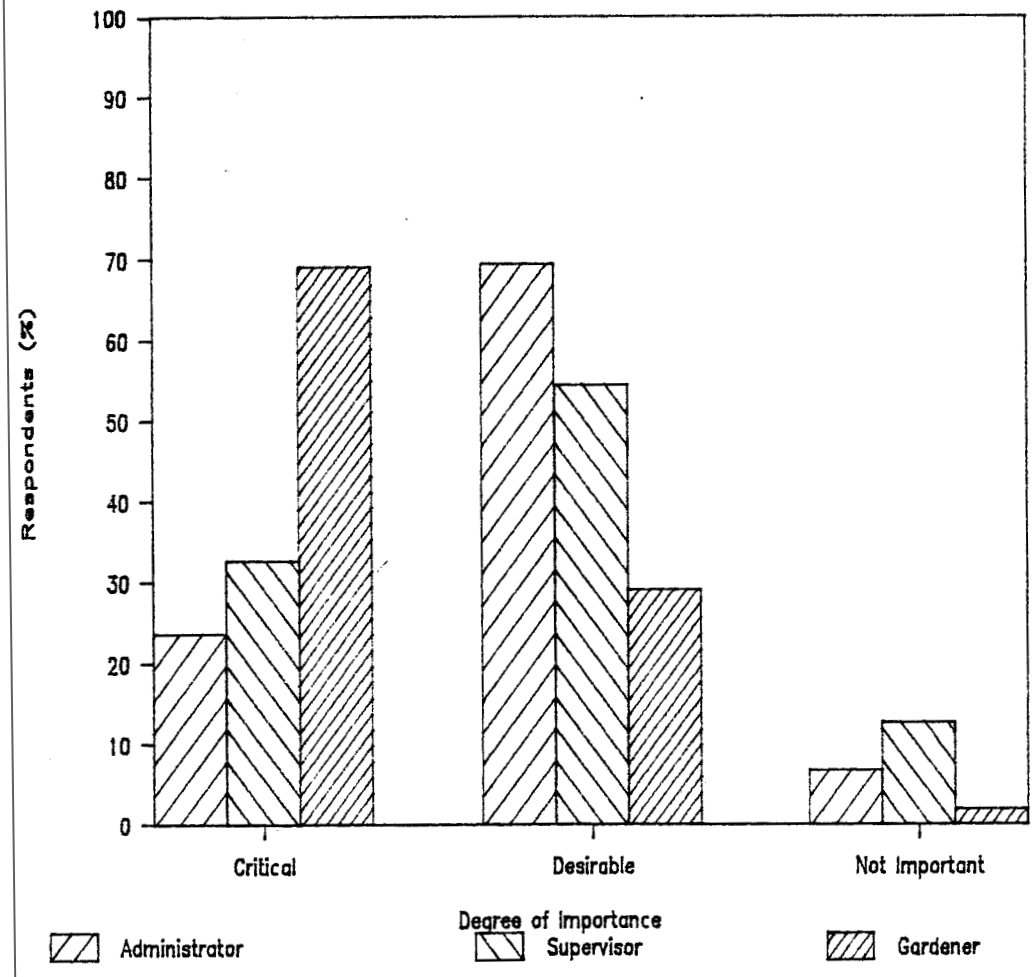

Figure 4. Identification, selection and care of annuals and herbaceous perennials. Survey skill question asked of administrators, supervisors, and gardeners of public institutions.

administrators and supervisors. One plausible explanation may lie in the area of gardener qualification. As noted in Table A-4, gardeners currently exceed the minimum entry-level requirements of gardeners that are desired by administrators. Consequently, gardeners are more likely

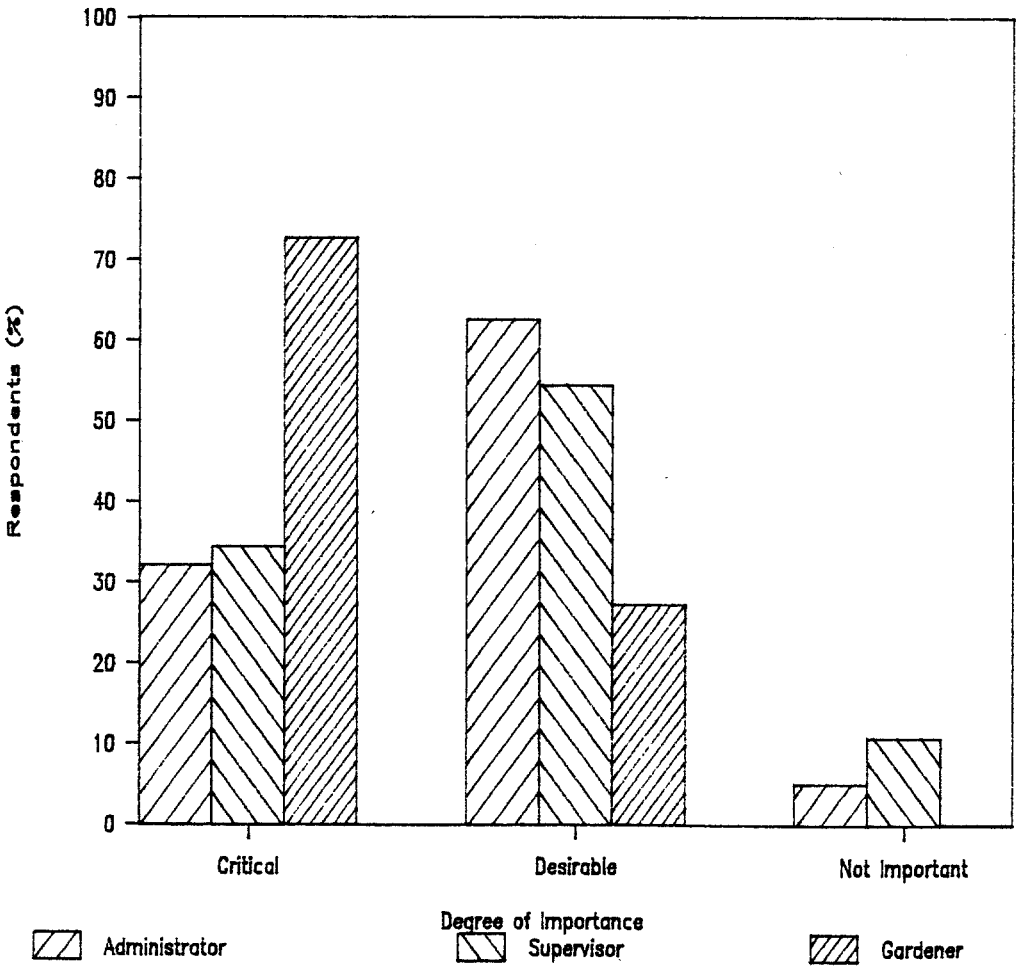

Figure 5. Identification, selection and care of trees, shrubs, and vines. Survey skill question asked of administrators, supervisors, and gardeners of public institutions.

to regard areas they have had some formal training in more highly than administrators or supervisors, who may consider these skills to be somewhat less important. In addition, gardeners that are more likely to be in greater contact with these horticultural procedures on a daily basis, would also be expected to rank them more highly than any other personnel level.

The identification and care of turfgrass, and the identification and care of non-hardy plants (i.e., tropical conservatory plants) are more often "desirable" to "not important" than "critical" gardener skills (see Table A-10., skills c and d). Selection, handling, and use of pesticides, fertilizers, and mulches, however, are more often "desirable" or "critical" than "not important" based on the personnel who responded to my survey (see Figure 6.).

It is interesting to note that almost twice the number of gardeners as administrators or supervisors, believe the use of pesticides is a "critical" gardener skill (see Table A-10, skill e). In light of escalating governmental regulations on pesticide handling and application procedures, the currently lukewarm stance taken by administrators on pesticides issues is somewhat

disconcerting. One-third (35.6%) feel that pesticide selection, handling and use is "critical" for gardeners, as do an only slightly greater number of supervisors (40.0%).

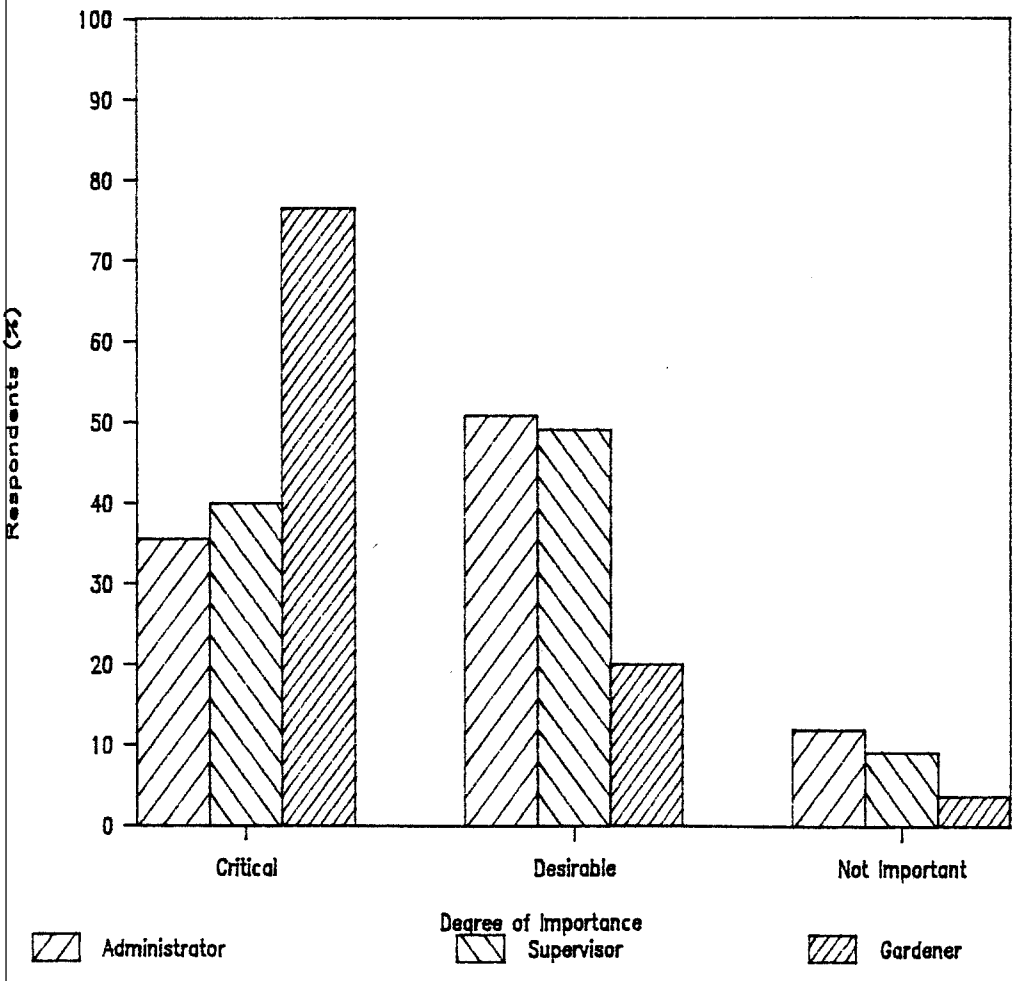

Figure 6. Selection, handling, and use of pesticides. Survey skill question asked of administrators, supervisors, and gardeners of public institutions.

Similarly, gardeners believe that the selection, handling, and use of fertilizers (see Figure 7.), and the selection, handling, and use of mulches are "critical" nearly twice as often as administrators or supervisors (see Table A-10., skills f and g). Again, the only

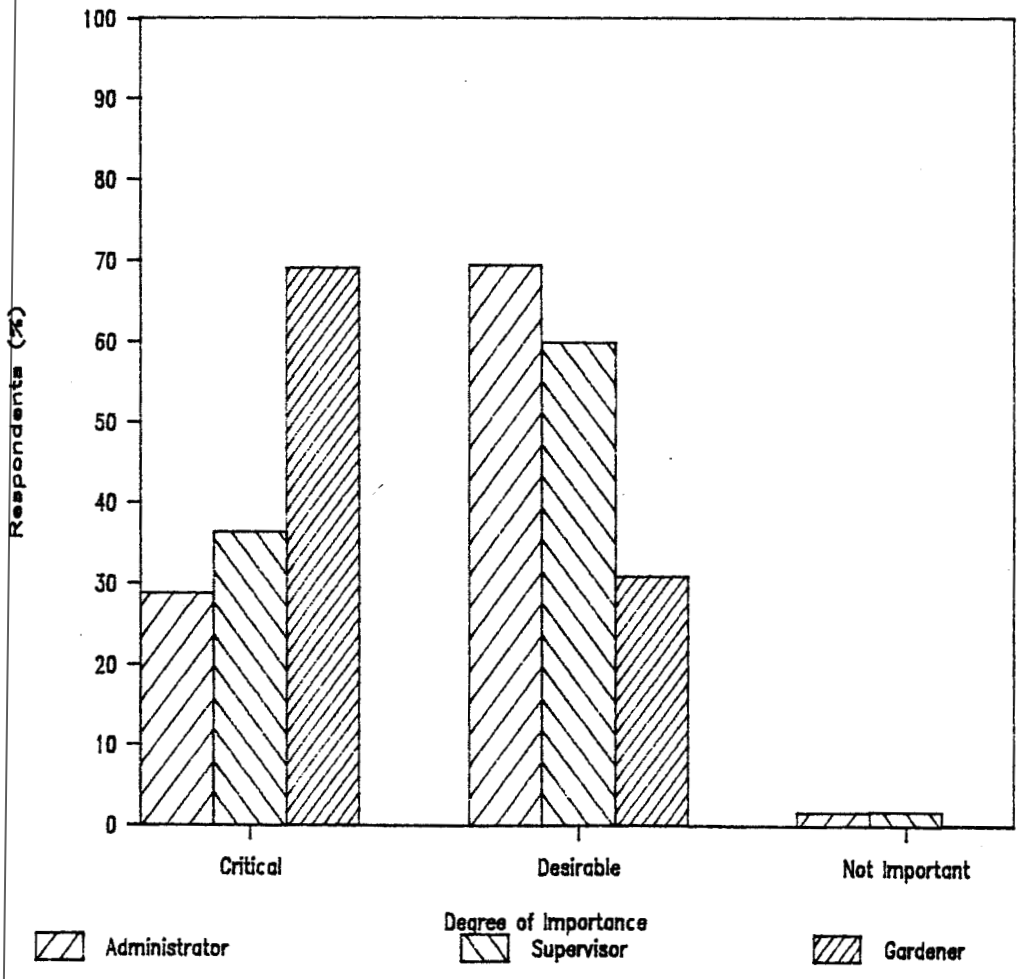

Figure 7. Selection, handling and use of fertilizers. Survey skill question asked of administrators, supervisors, and gardeners of public institutions.

explanation that I can offer is that frequency of performance and intimacy of contact in all likelihood predisposes gardeners to view these skills more highly than administrators or supervisors do.

Demographically, respondents from the warmer geographic hardiness zones of 7, 8, 9 and 10 believe that fertilization is a "critical" gardener skill more often than respondents from zones 1, 2 and 3, or zones 4, 5 and 6. This is most likely due to the longer growing seasons that warmer climates typically experience. Plant fertilization and maintenance operations would be expected to be more frequent in regions that have longer growing seasons. Oddly enough, however, is the fact that pesticide handling, use and selection is "critical" in all geographic hardiness zones represented in my survey. Apparently, applying pesticides more frequently does not necessarily guarantee that this skill is any more "critical" to gardeners of warmer zones than it is for gardeners of cooler zones having shorter growing seasons.

The handling, use, and care of hand tools (95.8%) and small power equipment (97.1%) are "critical" gardener skills according to all personnel levels surveyed (see Figure 8.); "desirable" over half the time (56.0% [see

Table A-10., skills h, i and j]) is the handling, use, and care of large power equipment.

Hand tools are such basic components of most horticultural tasks that their importance for gardeners

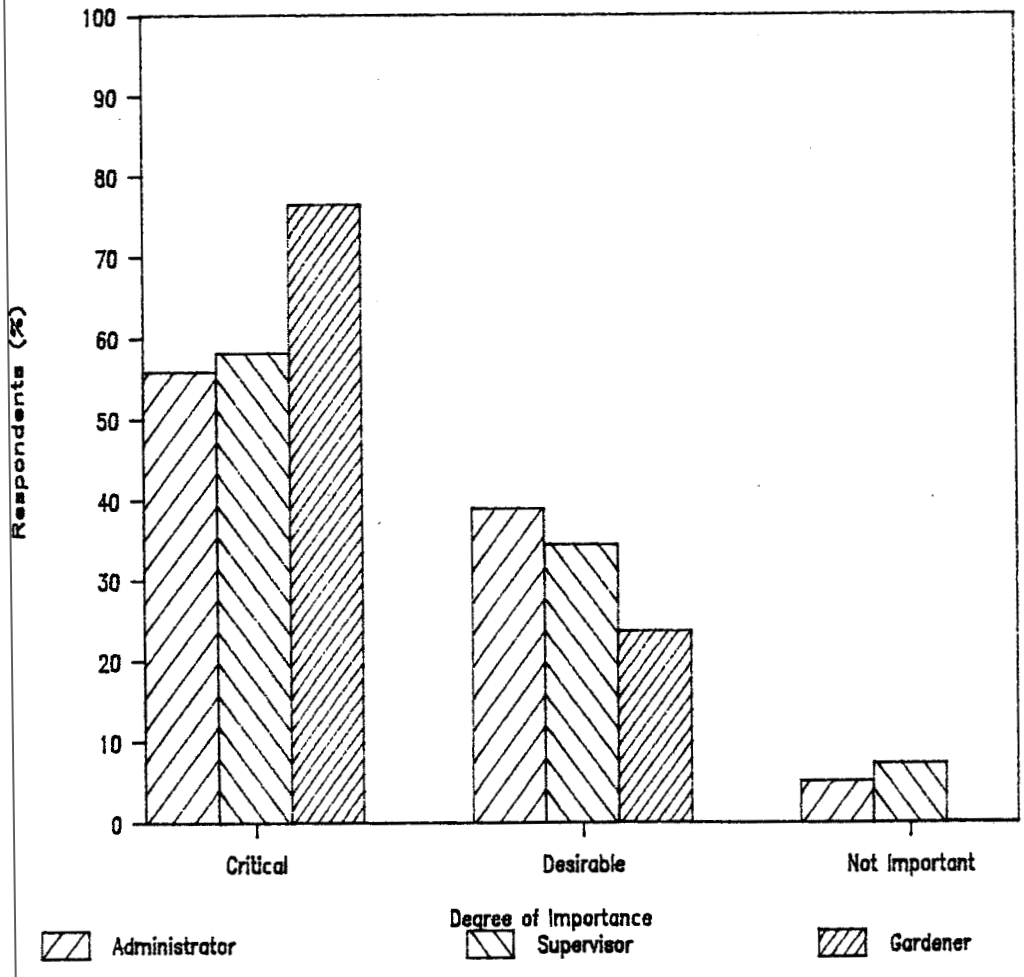

Figure 8. Handling, use and general care of hand tools. Survey skill question asked of administrators, supervisors, and gardeners of public institutions.

comes as no great surprise. Of greater significance is the increasing emphasis on the operation and maintenance of small and large power equipment. Horticultural tasks that were once performed by hand (e.g., cultivation of herbaceous flower beds) continue to be carried out by a wider range of power equipment. The increased usage of equipment requires that gardeners be more familiar with its operation and maintenance. The results of my survey clearly show that public institutions are well aware of the importance of power equipment skills for gardeners.

Proper pruning techniques are "critical" for gardeners according to virtually all gardeners (92.7%) that responded to the survey (see Figure 9.). Most respondents, in fact, consider this skill to be the most important skill listed in Table A-10 (see skill k). Interestingly enough, Hodyss' survey (1971) identified "Pruning of trees and shrubs" to be among her "most highly rated skills and knowledge" category. Pruning, without a doubt, is as important a skill for gardeners today as it was in 1971.

On the average, slightly more than half (53.9%) of the personnel surveyed believe that propagation of woody and herbaceous plants are "desirable" skills for

gardeners; 26.3% feel they are "not important" (see Table A-10, skill 1). Whereas Hodyss claimed that plant propagation was somewhat more important for gardeners in 1971, currently this skill is on the wain. The widespread use of advanced propagation methods (e.g., meristematic

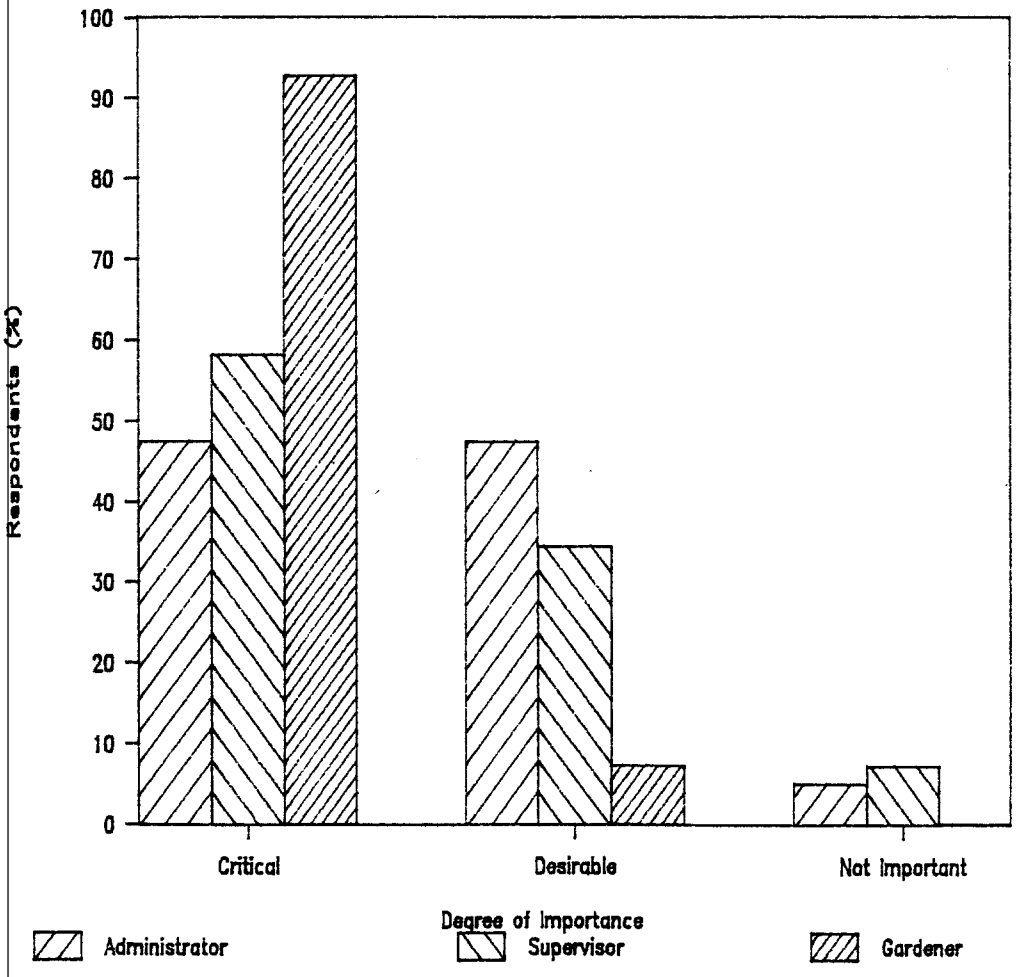

Figure 9. Proper pruning techniques. Survey skill question asked of administrators, supervisors, and gardeners of public institutions.

tip culture) may be one possible explanation for this change in importance. Increasing specialization may affect the way public institutions feel about this skill as a general horticultural practice for gardeners.

Twice the number of gardeners (65.5%) as administrators or supervisors believe that soil preparation, amendment, and testing is "critical" for gardeners (see Figure 10., skill m). As with the selection and use of pesticides, gardeners are more likely to be involved in the day-to-day handling and preparation of soil. It stands to reason, then, that they consider this skill to be more important than those who are less likely to be involved with the physical operation of this task on a daily basis (e.g., administrators and supervisors).

Although gardeners feel stronger about site mapping, surveying, and drafting than administrators or supervisors do, most respondents believe that this skill is relatively non-important for gardeners (see Figure 11. and Table A-10., skill n). In addition, interpretation of landscape drawings, and selection, installation, and maintenance of landscape construction materials are only slightly more important for gardeners. Nearly half of all

responding administrators and supervisors believe that both skills are of little value to gardeners (see Table A-10., skills o and p).

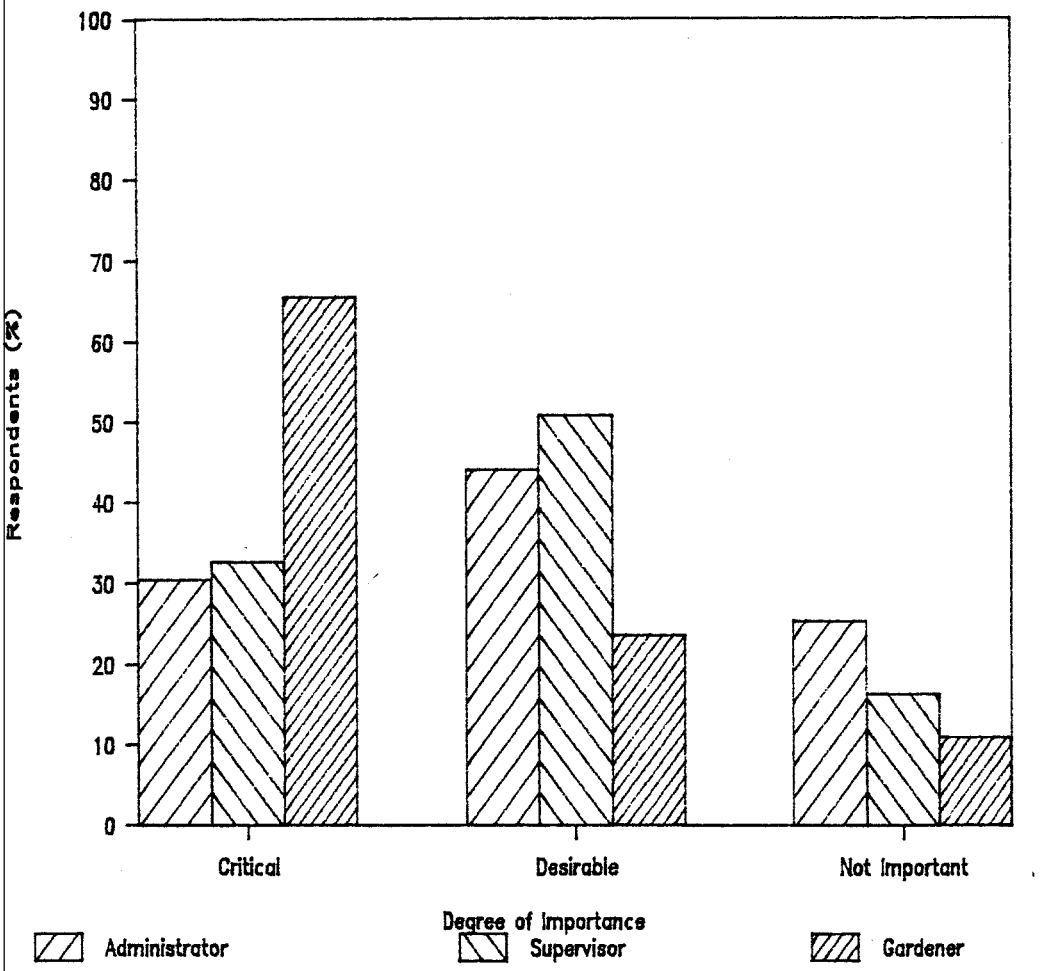

Figure 10. Soil preparation, amendment, and testing. Survey skill question asked of administrators, supervisors, and gardeners of public institutions.

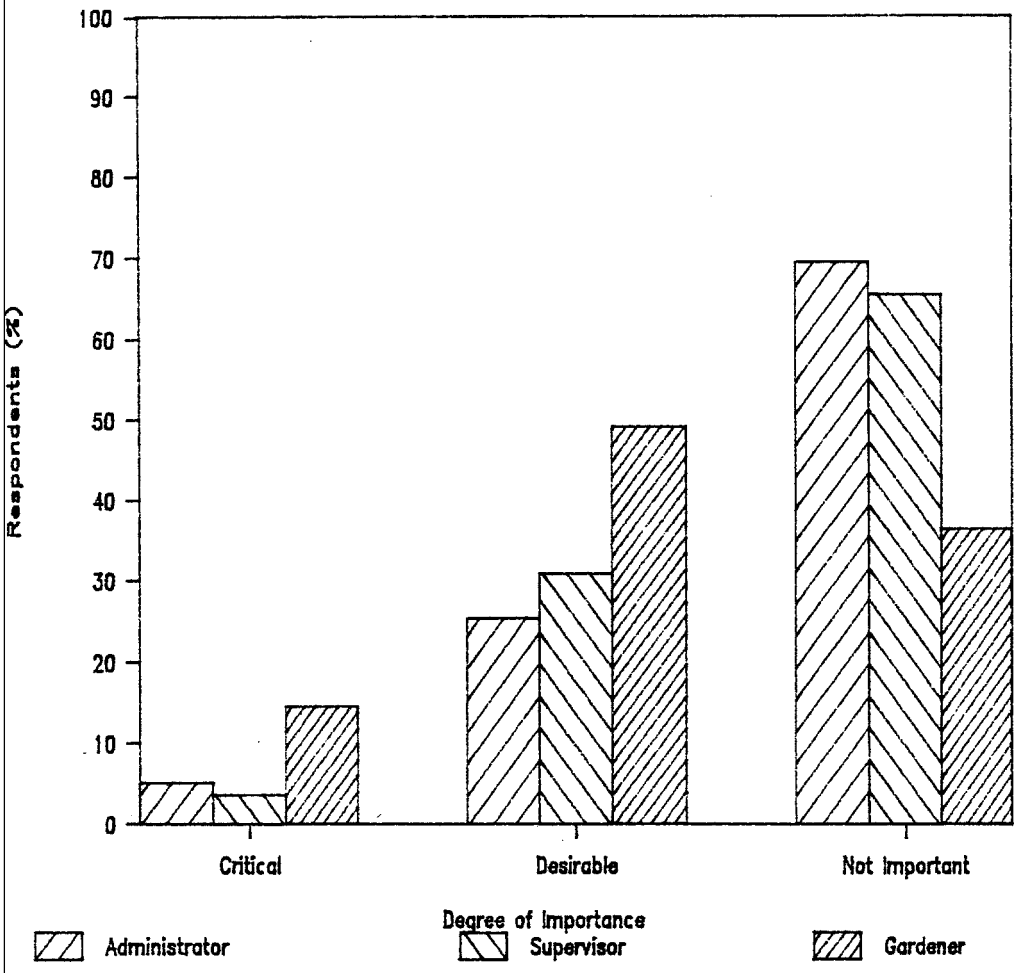

Figure 11. Site mapping, surveying, and drafting. Survey skill question asked of administrators, supervisors, and gardeners of public institutions.

Time management (see Figure 12.), followed by effective communication with colleagues and the public, are the most important basic management skills for gardeners (see Table A-10., skills t and s). Conversely, preparation of budgets and forecasting of costs is the

least desirable for gardeners among those supervisory skills included in the survey (see Figure 13. and Table A-10., skill q).

This preference for time management and

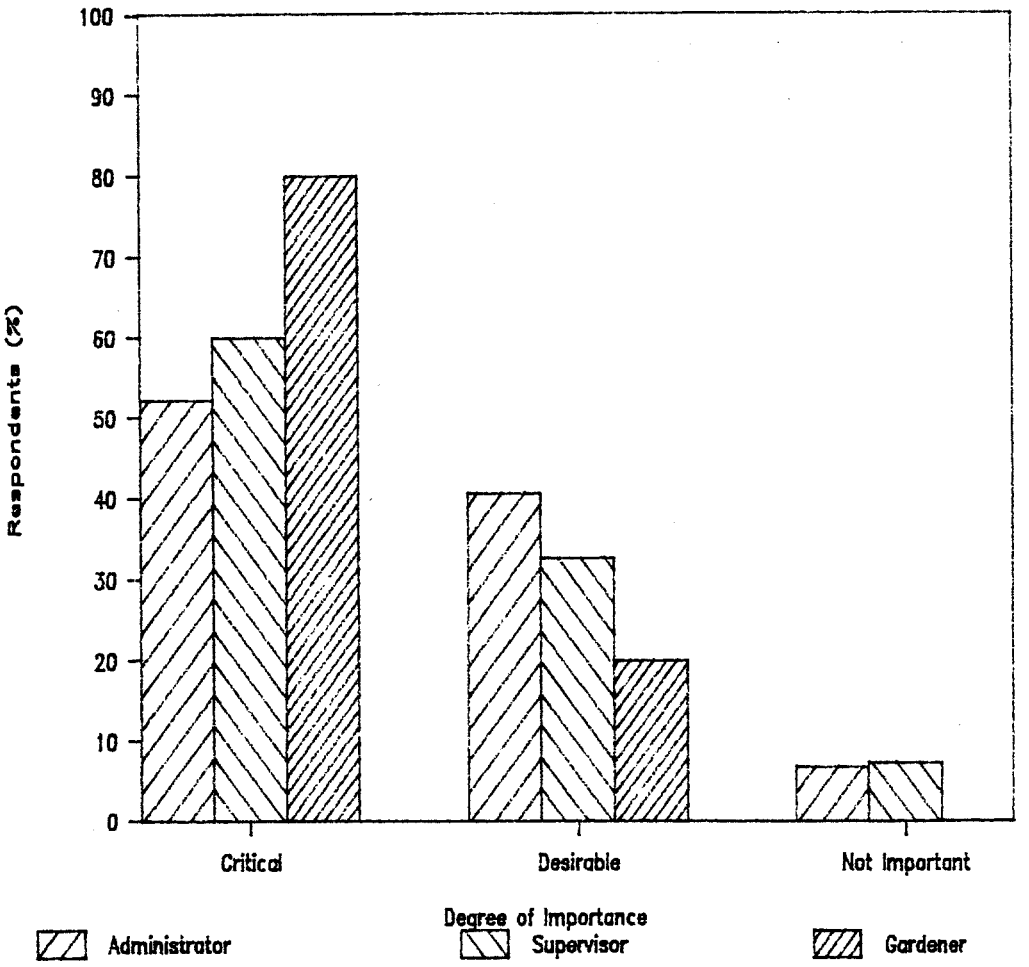

Figure 12. Management of time. Survey skill question asked of administrators, supervisors, and gardeners of public institutions.

communication skills underscores the importance of providing certain basic management training for gardeners. The performance of many horticultural operations (i.e., the planting of bedding plants) requires the development of some basic management skills by those that perform

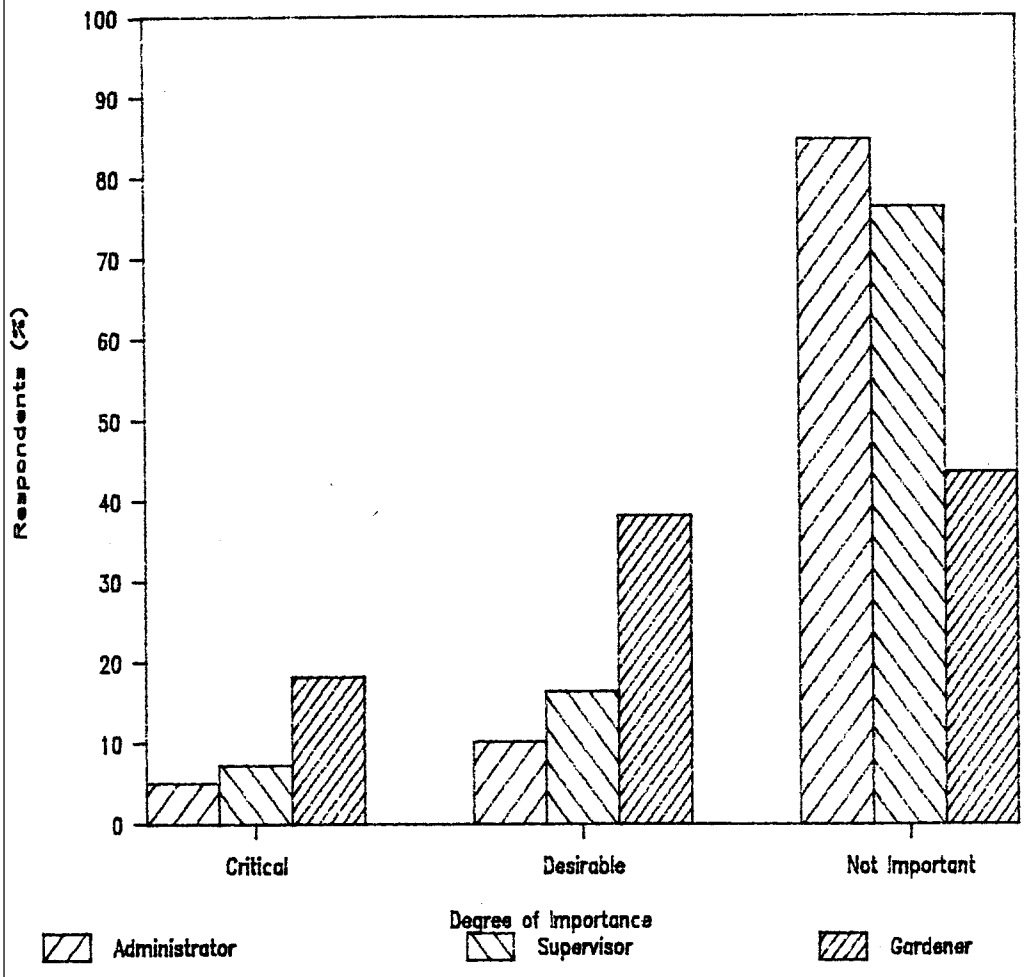

Figure 13. Preparation of budgets and forecasting of costs. Survey skill question asked of administrators, supervisors, and gardeners of public institutions.

these operations. Knowing which steps to follow, in what order, and for how long, are all components of time management that gardeners commonly experience in the normal course of their horticultural duties. While the importance of time management for supervisors is well documented, its importance for gardeners has not been clearly identified. Zelonis states in "Grounds Maintenance Time Requirements,"

> Task time requirement approximations enable managers to more accurately schedule personnel where they are most needed (Zelonis 1987, 6).

My survey results revealed that communication with colleagues and the public is only slightly less important for gardeners than is time management (see Figure 14.). Almost seventy percent (69.1%) of the gardeners, and over forty percent (41.8%) of the supervisors believe this skill to be "critical" for gardeners. There is a growing consensus among public institutions of the importance of effective communication skills for gardeners. Gardeners must not only be able to communicate with their supervisors and fellow staff members, they must also have the basic ability to respond to the questions of an inquisitive visiting public.

Responding gardeners believe that project management and supervision is a "critical" gardener skill three times as often as administrators and supervisors do (see Table A-10., skill r). This is interesting; gardeners believe that some supervisory and project

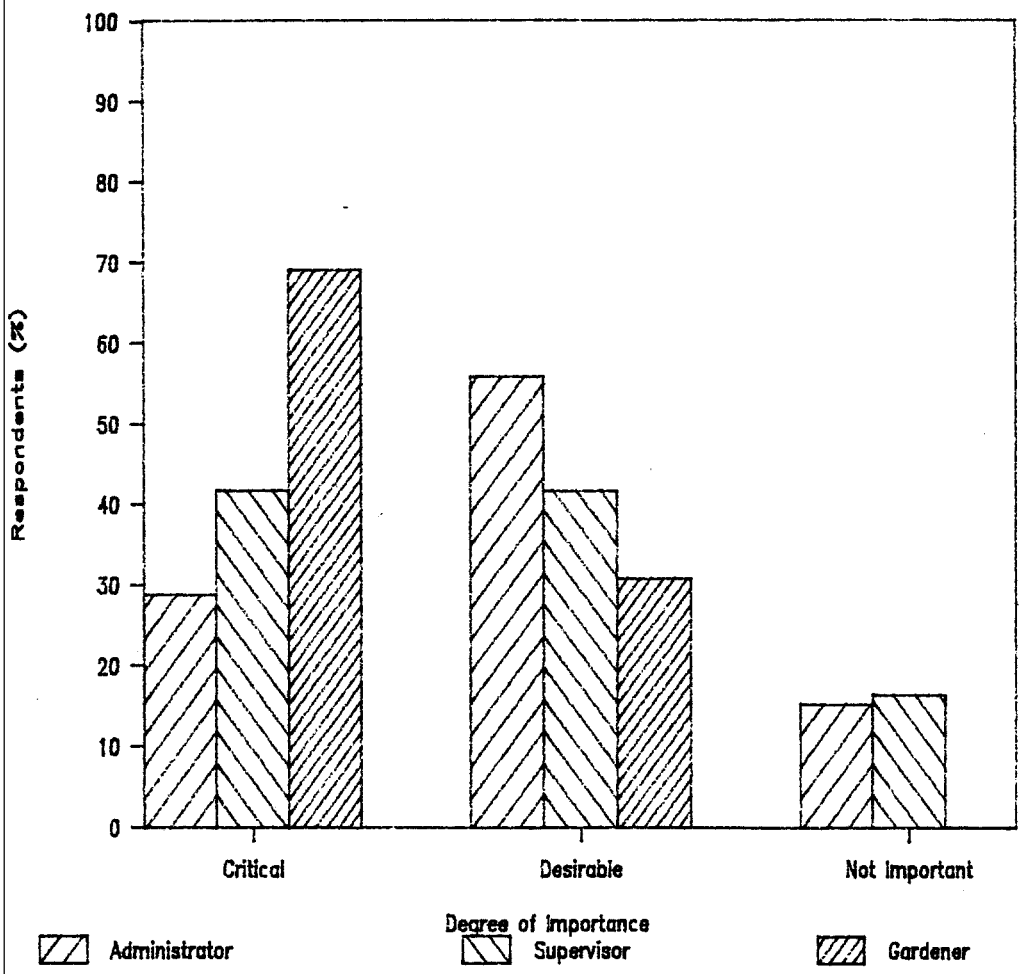

Figure 14. Effective communication (oral and written) with colleagues and the public. Survey skill question asked of administrators, supervisors, and gardeners of public institutions.

management abilities are necessary for the work they perform, whether or not administrators or supervisors feel the same way.

I believe that gardeners commonly experience "supervisory" roles in a number of ways. They may:

* coordinate volunteers, interns, and other gardeners temporarily or permanently assigned to their garden areas

* track the progress of assigned projects by directly communicating desired results to subordinates, and actual results to supervisors

* coordinate and implement project tasks

To more effectively handle basic management issues, gardeners must receive training in these areas prior to their employment by public institutions.

Proper pruning techniques are as important for gardeners today as they were in 1971 (Hodyss), on the basis of my survey results. Other skills "critical" for gardeners today that were not among Hodyss' "most highly rated" survey group include:

* handling, use, and general care of small power equipment

* handling, use, and general care of hand tools

* time management

* identification, selection, and care of trees, shrubs and vines
* identification, selection, and care of annuals and herbaceous perennials
* selection, handling, and use of pesticides
* selection, handling, and use of mulches
* selection, handling, and use of fertilizers

Conversely, the skills that are "not important" for gardeners today, that were "most highly rated" in 1971 (Hodyss) are:

* turf establishment and maintenance
* plant propagation

All personnel levels surveyed agree that familiarity with botanical and horticultural literature and use of plant keys are "desirable" but not "critical" gardener skills. Although over twice as many gardeners believe these skills are "critical" as compared with administrators or supervisors (see Table A-10., skills u and v), no plausible explanation for this can be offered, other than the probability that gardeners rely on both skills more often than administrators or supervisors realize.

11. Future Gardener Positions

Nearly seventy-five percent of the administrators

that responded plan to hire from one to five gardeners within the next five years. Only three administrators plan to hire no gardeners within this same period of time (see Table A-11.). Considering that forty-two of the fifty-nine (71.2%) responding institutions presently employ from zero to fourteen full-time gardeners, this anticipated increase in gardener positions appears to be commensurate with current gardener employment trends (see Table A-2).

12. In-Service Training Programs

An institutions commitment to staff in-service training programs may reflect how it feels about the training of the personnel it hires, as well. Several questions regarding in-service training programs were included in my survey to help determine if any correlations exist between in-service training in public institutions and the qualifications these institutions desire of the gardeners they seek to employ.

Nearly two-thirds of the administrators (62.7%), and slightly more than half of the supervisors (54.5%) currently have in-service training programs for their horticultural staffs (see Table A-12.). On the average,

over half of these programs (61.8%) consist of non-formal, on-the-job training (see Table A-13., adding codes 2, 4 and 5). Slightly more than one-third (38.2%) feature formal classroom or seminar sessions (see Table A-13., adding codes 1, 3 and 6).

Whatever the methods used, the results of my survey provide information that can be used to design programs that address horticultural and basic management topics that administrators, supervisors and gardeners believe are most valuable for gardeners. Those institutions that plan to have in-service programs in the future can also benefit from this information by picking and choosing training topics most important or appropriate for their horticultural staffs and particular situations.

Readers wishing to learn more about the use and design of in-service training programs are directed to an organization that can provide a great deal of information on the subject, the American Society for Training and Development, 1630 Duke Street, Box 1443, Alexandria, VA. In addition to their monthly publication, Training and Development Journal, the society also sponsored the publication of a widely renowned reference guide to training and development:

* Training and Development Handbook, by Robert L. Craig (McGraw-Hill Book Company, 1976).

Excellent discussions on establishing and administering in-house training programs can also be found in the following books:

* Building Successful Training Programs, by Kay Tytler Abella (Addison-Wesley Publishing Co., Inc., 1986)

* Training and Development: A Guide for Professionals, by George S. Odiorne and Geary A. Rummler (Commerce Clearing House, Inc., 1988)

* Training in Organizations: Needs Assessment, Development, and Evaluation, by Irwin L. Goldstein (Brooks/Cole Publishing Company, 1986).

Although less than half the responding administrators (48.0%) and only one-fourth of the supervisors plan to implement in-service training for their employees within the next five years (see Tables A-14. and A-15.), I believe that no valid statement can be made regarding the future of horticultural in-service training in public institutions based upon the low response rate to this particular question (120 non-responses were recorded).

13. Basic Management Skills

Administrators, supervisors, and gardeners were asked to rank, in order of importance, a number of supervisory-associated skills for both their "supervisors" and "gardeners" (see Tables A-16 and A-17):

* ability to supervise and motivate
* ability to effectively manage time
* ability to communicate effectively
* ability to predict project needs
* ability to organize and implement projects
* ability to manage conflicts
* ability to manage finances.

From the survey results, most personnel believe that:

* the ability to supervise and motivate others (see Figure 15.)
* the ability to organize and implement projects
* the ability to effectively manage time

are the most important basic management skills their "supervisors" can have. The skill that all levels believe is the least important for "supervisors" is the ability to manage finances (see Table A-16., letter g).

The supervisory skills most often desired of "gardeners" at these institutions are:

* the ability to effectively manage time (see Figure 16.)

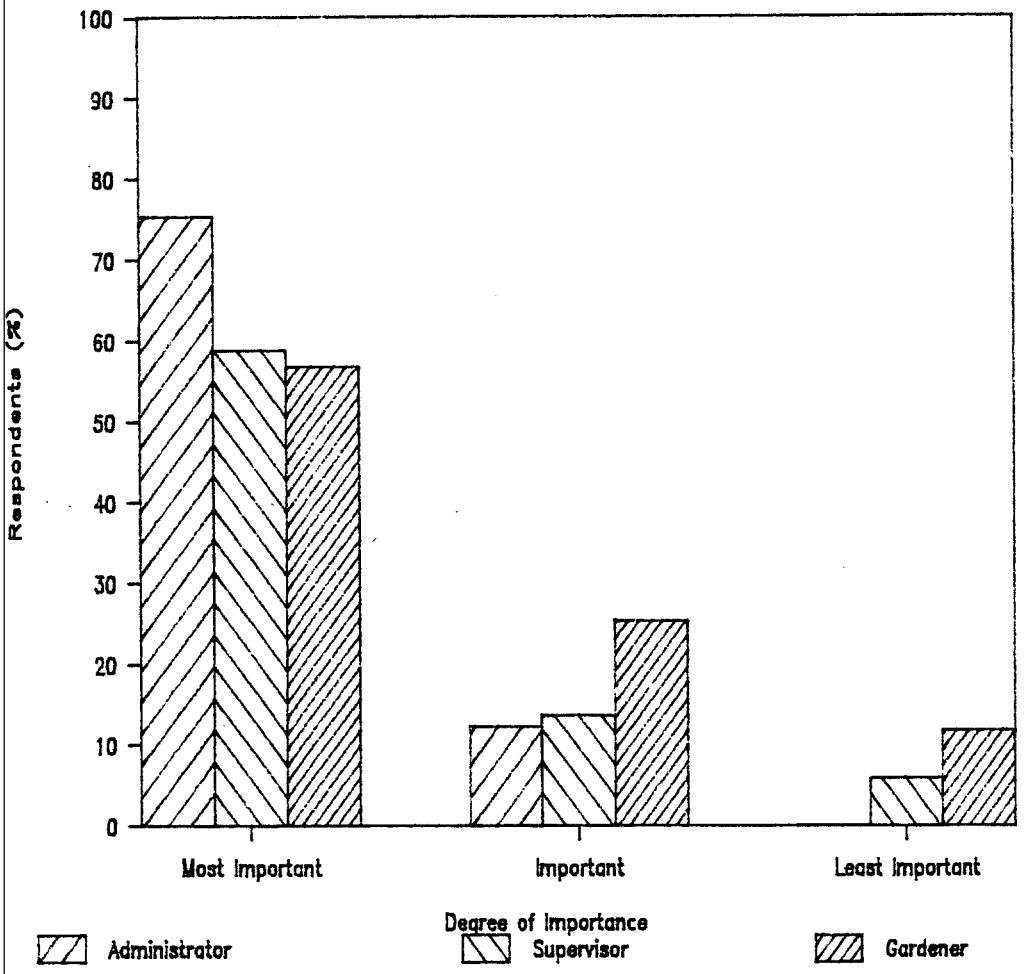

Figure 15. Ability to supervise and motivate others. Supervisory skill most often desired of supervisors, taken from survey of administrators, supervisors, and gardeners of public institutions.

* the ability to organize and implement projects
* the ability to communicate effectively

From the above discussion, time management and project organization and implementation are clearly the two basic management abilities most frequently desired of

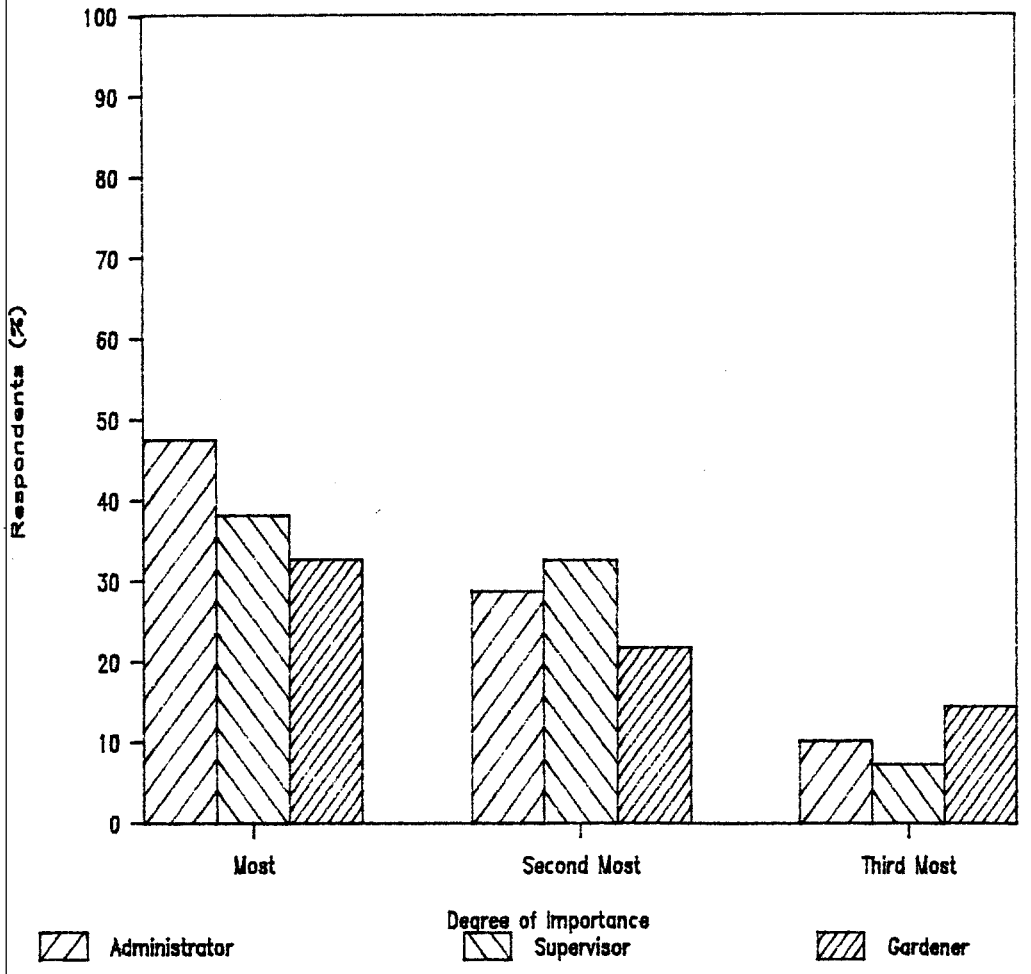

Figure 16. Ability to effectively manage time. Supervisory skill most often desired of gardeners, taken from survey of administrators, supervisors, and gardeners of public institutions.

both gardeners and supervisors. The ability to communicate effectively is also an important skill for both supervisors and gardeners, based on my survey results (see Tables A-16. and A-17., letter c).

Interestingly enough, the ability to manage finances, the least important basic management skill for "supervisors", is also the least important for "gardeners".

Though all survey participants had the opportunity to indicate that basic management skills were not important for gardeners by means of a "none of the above are important" response option, only one respondent chose to do so. Undoubtedly, personnel of public institutions that employ gardeners do feel that some basic management skills are important for gardeners.

14. Additional Issues

Excluding non-respondents, forty-eight out of ninety-one (52.7%) administrators, supervisors, and gardeners believe that academic (i.e., classroom instruction) and practical (i.e., on-the-job) gardener training is preferable to academic or practical training alone (see Table A-18., adding codes 1, 3, 5 and 8).

This speaks highly of gardener training programs that combine both hands-on and in-class instruction. Public institutions prefer horticulturists who can effect practical applications to theoretical principles in the workplace, and can facilitate basic management concepts into their daily work routines.

CHAPTER II

PROFESSIONAL GARDENER TRAINING PROGRAMS

My survey of public institutions (Chapter I) found that the most desirable horticultural skills for gardeners include:

* handling, use, and general care of hand tools and small power equipment
* identification, selection, and care of trees, shrubs, vines, annuals, and herbaceous perennials
* selection, handling, and use of pesticides, mulches, and fertilizers

In addition to horticultural skills, my survey also identified several basic management areas that were important for gardeners. These were:

* time management
* project organization and implementation
* effective communication (oral and written)

To assess how well current professional gardener training programs are providing students with the kinds of knowledge and skills my needs assessment survey identified

as important for gardeners, I examined three existing professional gardener training programs with a view toward comparing their program content, not only with each other, but with the subject areas I have identified above.

A. Overview

The professional gardener training programs that I have studied are:

* The Longwood Gardens' Professional Gardener Training Program (PGTP)
* The New York Botanical Garden's (NYBG's) School of Horticulture
* The Niagara Parks Commission's (NPC's) School of Horticulture

The criteria I used to select these programs can be found in Chapter I (pg. 6). In addition, there are a number of elements common to programs of this kind that should be mentioned. These elements reflect a portion of what Frowine (1972) stated about programs of this type in his thesis entitled "An Educators Guide to Programs, Services, and Facilities of Arboreta and Botanical Gardens of Northeastern United States and Nearby Canada."

Adapting some elements that Frowine observed, the programs that I examined:

* provide a blend of academic and practical experience in many phases of horticulture
* offer student gardeners the opportunity of on-the-job problem solving
* provide a low student-teacher ratio that is conducive to learning
* are located at public, not-for-profit institutions
* are post-high school level; certificates or diplomas are conferred, not academic degrees
* are intensive, ranging in length from twenty-one to thirty-six months
* either require or recommend work experience in private or public horticulture prior to program entry

I feel that more than a brief comparison of these three programs would be redundant in view of the in-depth treatment I provide in Appendix M. Therefore, my discussion will be confined solely to those elements that are unique in each program studied.

B. Program Differences

The only program which does not at the present time accept foreign applicants for their program is Longwood Gardens' PGTP. The Niagara Parks Commission's

School of Horticulture began accepting one foreign student per year in April of 1988. The New York Botanical Garden accepts foreign students subject to certain qualifications (see Appendix M).

Acceptance of foreign students for the Niagara Parks Commission's School of Horticulture marks a significant step in the School's fifty-two year history. Previously, the program had been available solely to Canadian students. Longwood Gardens reserves the right to select only students from the United States based upon their private sources of funding, and their administration of an internship program for international students. The aforementioned program accepts up to four international students per year for one year paid internships at Longwood Gardens.

The NYBG's School of Horticulture currently accepts from twelve to a maximum of fifteen students per year. Longwood Gardens limits enrollment to fourteen students every-other year. The NPC's School of Horticulture maintains a total student enrollment of thirty-six; accepting and graduating up to twelve students annually.

The only program that operates on a bi-annual basis is Longwood's PGTP. The NPC's and The NYBG's programs begin annually, but they differ in length. The NPC's School of Horticulture program requires thirty-six consecutive months of study. Longwood's PGTP is second longest at twenty-four months, while The NYBG's School of Horticulture is the shortest at twenty-one months.

The length of each program is closely tied to program objectives. The Niagara Parks Commission's School of Horticulture believes that providing students with sound horticultural training and real-life basic management situations will make them more effective professional gardeners. The School feels a three-year program best suits their students' needs; a majority of the program's first and second years are devoted to practical and academic training in horticulture, while the third year focuses on management concepts involving two distinct phases.

Phase one includes a ten-week work practicum during the summer months with the Horticulture Department of the Niagara Parks Commission. Students experience what it is like to work in the "real world", as apprentice gardeners for the Niagara Parks Commission. Management

concepts noted in class are impressed upon students by observing various management styles in the workplace. Learned and observed techniques are put into practical use during phase two, which centers around academic courses and a month-long "foremanship" of the 100-acre School botanical garden/arboretum. During this period, a student "foreman" is responsible for planning and supervising the on-campus work of all first, second and third-year students, meeting periodically with staff personnel, and participating in work evaluation sessions of student "employees". Although assistance and guidance is provided by School staff, most of the day-to-day planning and work assignments are implemented by the student "foreperson" in charge.

Longwood's Professional Gardener Training Program handles basic management experiences for students through half-day per week "student projects". Student "foreperson", randomly selected to serve terms of one month each, are responsible for planning and supervising the landscape maintenance activities of fellow students in areas adjacent to student housing. The student in charge may be expected to design annual flower borders, or assign and authorize other students to mow turf or prune woody

ornamentals. Foremen must also coordinate the work efforts of their crew to efficiently carry out weekly work details. In so doing, students gain valuable experience in the areas of time management and project planning and implementation.

In-residence students of Longwood's PGTP also experience basic management situations by serving six-month voluntary terms as resident "dormitory representatives" or "kitchen aides" in one of three student houses on the grounds of the Garden. Dormitory representatives assign and supervise weekly house chores, handle daily concerns and complaints of fellow housemates, and report special problems and concerns to a dormitory supervisor. Kitchen aides keep a running inventory of household kitchen and cleaning supplies; purchasing more as this becomes necessary from a house usage fund. Students are given the opportunity to apply basic management concepts learned in class; they also learn by observing the management styles of other students who are placed in similar roles as their turns arrive.

The New York Botanical Garden's School of Horticulture offers students very little basic management training. Students receive training primarily in

horticultural areas. As compared with either Longwood Gardens' PGTP or the NPC's School of Horticulture, most students enrolled in The NYBG School of Horticulture tend to be somewhat older (early twenties to early fifties), and usually have some basic management abilities from past life experiences. Approximately half of the students entering the program at NYBG already hold bachelor's degrees in other fields; many enter as a result of career changes. As such, the School believes that students do not require much training in the area of basic management.

The New York Botanical Garden's horticultural infrastructure, much like Longwood's, makes it difficult for students to have truly valuable basic management experiences within publicly viewed garden areas. Student hands-on work consists primarily of task implementation; very little management or decision making ability is called for during these work sessions.

While I recognize the complexities of providing students with these kinds of experiences in gardens as large and complex as Longwood Gardens' or The New York Botanical Garden, I also believe that these experiences are vital to students if they are expected to effectively

work as gardeners within public institutions. My survey revealed that administrators, supervisors, and gardeners of public institutions believe that certain basic management skills are important for gardeners. As established in Chapter I, gardeners need to develop:

* the ability to effectively manage time
* the ability to organize and implement projects
* the ability to communicate effectively

How can students learn and develop these kinds of skills if they are not given the opportunities to practice them?

Longwood Gardens' attempts to coordinate student management experiences in specific public garden areas maintained by staff gardeners have often resulted in much consternation. Section heads and foremen, while willing to give students some project coordination and management opportunities, are continually frustrated over the inconsistency and poor follow-through students have usually provided them. Some students may be present on Monday, attend classes on Tuesday and Wednesday, and return to work on Thursday and Friday.

I believe that the real challenge for professional gardener training programs is to provide realistic work

environments for students which will allow them to experience theoretical management concepts in real-life situations. Practical experiences of this kind are most effective during periods of peak outdoor activity. In The Niagara Parks Commission's School of Horticulture, for example, each program year is divided into two principal parts. The first part consists primarily of classroom instruction from September to March, when useful outdoor work experience is minimal. The second part, consisting of hands-on horticulture and landscape management experiences takes place from March through September when conditions out-of-doors are more ideal for experiences of this kind.

Longwood's PGTP utilizes a three-day practical /two-day classroom training approach. The NYBG's School of Horticulture follows a schedule similar to Longwood's during each student's second year, modifying this ratio to a two-day practical/three-day classroom schedule during the first year.

Citing the example of the NPC's School of Horticulture, I believe that longer periods of time are needed for practical work experience during favorable outdoor seasons. Better continuity for students and for

garden staff would be promoted by practical work periods that are a minimum of four consecutive days long (e.g., Monday through Thursday). Students would be much more useful to staff gardeners, since more consistency would be gained by longer periods of work time. This would give staff gardeners more options in using student help, and might also encourage them to give students more responsible assignments within their areas. Project follow-through would in all likelihood also be enhanced by restructuring practical work periods during periods of most critical need.

The NYBG's School of Horticulture is the only professional gardener training program surveyed that does not compensate students for practical work carried out on their grounds. Both Longwood Gardens and The Niagara Parks Commission pay students a bi-weekly stipend for work rendered on-site. The New York Botanical Garden does, however, assist students with finding part-time work in the New York area to help them meet program tuition costs.

Longwood Gardens charges no tuition to students enrolled in their Professional Gardener Training Program, and provides housing free of charge. Students of this program incur the smallest out-of-pocket expenses, paying

an average of $525 for books and supplies (excluding food) during the programs entirety. The Niagara Parks Commission's School of Horticulture provides room and board for first and second year students, only, as part of their overall tuition expenses. Third-year students, however, must obtain their own off-campus housing. All books and supplies are the responsibility of the students.

Students of the NYBG's program are required to provide their own lodging while enrolled in the program. In addition, books and supplies amounting to approximately $500 over the course of the twenty-one month program, must be paid for by the students.

Various pros and cons can be cited for providing or not providing on-site housing for students of professional gardener training programs. Off-site living places the burden of finding and maintaining suitable lodgings on the students. Arguably, a certain element of responsibility and self-sufficiency is forced upon those who must provide their own transportation, pay for rent and utilities, and interact with the "real world" on a daily basis.

On-site housing relieves students from commuting and landlord pressures by placing the burden of facility maintenance on the institutions providing the housing. Students, some believe, are more likely to utilize the hosting institutions' resources for after-hours studying; devoting the time that would normally be spent on commuting and "making ends meet" to learning about and observing horticulture within the gardens that surround them.

While learning is generally dictated by the individual aspirations and motivation of each student, I believe that on-site housing provides a more effective total learning environment for students of professional gardener training programs. Students learn from passive as well as active experiences. Living within the environment they work and study, I feel, reinforces their learning in hard to measure ways. Daily interaction with fellow students that attend the same lectures, work through similar hands-on experiences, and observe many of the same things in all likelihood stimulates students to question, discuss, and formulate intelligent opinions of their own concerning the experiences they have while in the program. Students in-residence are "closer" to the

program, I believe, and tend to be more totally committed to the program than students who live off-campus.

Student Alumni Association dues for each program studied are variable. The highest annual membership dues, $35 (CAN), are charged to alumni of The Niagara Parks Commission's School of Horticulture. An initial fee of $100 (CAN) is charged to students entering the School; however, this fee is also applied toward each student's graduation expenses. Longwood Gardens' Student Alumni membership fees are $10 per year. There are no fees presently charged to alumni of The NYBG's program.

1. Academic Requirements

The NYBG's School of Horticulture is currently the only professional gardener training program that does not require students to prepare a formal oral presentation on a horticultural topic. Longwood's PGTP requires students to give three thirty-minute oral presentations, and The NPC's School of Horticulture requires three thirty-minute oral presentations, or one thirty-minute and one sixty-minute presentation on horticultural topics.

Oral and written communication skills are important for gardeners. As discussed in Chapter I, the ability to communicate effectively with colleagues and the public is a skill that is highly valued of gardeners by public institutions. Oral presentations require students to systematically organize their thoughts before sharing them with others. This entails:

* researching horticultural topics
* organizing and committing to paper pertinent information
* verbalizing these ideas in an audible, logical and comprehensible manner

Preparing and presenting horticultural topics gives students valuable lessons in presenting both their work and themselves in a situation very similar to the ones they are likely to experience as professional gardeners.

Approximately seventy percent of all academic coursework at The Niagara Parks Commission's School of Horticulture is presented by School staff. One-third of the student instruction at The New York Botanical Garden is handled by staff, as is two-thirds of the instruction at Longwood Gardens.

The instructors in all of the programs that I studied, whether staff or non-staff, are very well

qualified to teach student gardeners in my opinion. While I could not determine the professional qualifications of each and every instructor, I did find that they all had in common one or more of the following academic and/or practical backgrounds:

* technical or professional training in horticulture or related areas
* certificate or diploma in ornamental horticulture
* associate or baccalaureate degree in horticulture, or closely allied field
* master's or doctoral degree in horticulture, or closely related field.

New York Botanical Garden is unique among public institutions that administer professional gardener training programs in that it also maintains joint agreements with two New York City Colleges of the City University of New York: the Bronx Community College, and the Herbert H. Lehman College. At the Bronx Community College, a joint agreement with the New York Botanical Garden offers an Associate's Degree in Ornamental Horticulture to students that spend their first year at Bronx Community College, and their second year at the New York Botanical Garden. Second-year students take courses in horticultural subjects and participate in hands-on garden work experiences.

A Baccalaureate Degree in Individualized Plant Studies is offered to students that enroll in the accredited horticultural program administered jointly with Lehman College. Again, some period of arranged horticultural study is required at The New York Botanical Garden. Both of these programs give students of The NYBG's School of Horticulture additional opportunities to continue their education and training in horticulture.

The New York Botanical Garden is currently seeking permission from the New York Department of Education to offer students an Associate's Degree in Occupational Studies (A.O.S.), with specialization in Ornamental Horticulture. If permission is granted, this accredited degree will replace The NYBG's non-accredited Diploma in Horticulture.

The total number of formal in-class hours required by each program varies widely, as does the number of required courses. This has to do in large part with the length of each program. The NPC's thirty-six month program requires a total of 1,379 classroom hours from forty-six required courses. Their names, and a brief description of each, can be found in Appendix K.

Longwood Gardens' twenty-four month program requires students to attend 1,008 in-class hours; thirty-four courses are required (see Appendix J). Students of The New York Botanical Garden's twenty-one month program attend forty-two required courses for approximately 452 hours of formal, in-class training (see Appendix L).

The following discussion of course comparisons is confined to significant differences, based upon the skills that administrators, supervisors and gardeners believe are important for gardeners. Questions 8 (Appendix D), 4 (Appendix F) and 3 (Appendix H) are the "yardsticks" I used for comparing the skills administrators, supervisors and gardeners believe are important for gardeners of public institutions, against the academic courses professional gardener training programs teach their students. This particular question is constructed in such a way that general horticultural areas are represented by more specific, but related, horticultural skills. In this way I was able to gauge the desirability of more general horticultural areas, such as:

1) identification, selection, and care of ornamental plants

by including a series of more specific, but related skills:

* identification, selection and care of annuals and herbaceous perennials

* identification, selection and care of trees, shrubs, and vines

* identification and care of turfgrass

* identification and care of non-hardy plants

By identifying which horticultural skills are preferred for gardeners by public institutions, I obtained a clearer picture as to which professional gardener training programs are most effectively preparing gardeners for careers in public horticulture at the present time. I also formed some opinions as to how these programs can be improved upon in the future, and made some assumptions about the relative importance of certain skills over others.

From the results of my survey, a list of general horticultural areas, and the specific skills which comprise these areas, continuing from the example listed on page 65, follows:

2) selection, handling and use of horticultural products

comprises the related, but more specific, skills:

* selection, handling and use of pesticides

* selection, handling and use of fertilizers

* selection, handling and use of mulches

3) handling, use and general care of horticultural equipment

comprises the related, but more specific, skills:

* handling, use and general care of hand tools (i.e., rakes, shovels, and pruners)

* handling, use and general care of small power equipment (i.e., chainsaws, rototillers, and line trimmers)

* handling, use and general care of large power equipment (i.e., tractors, dump trucks, and riding lawn mowers)

4) knowledge of basic horticultural techniques comprises the related, but more specific, skills:

* proper pruning techniques

* propagation of woody and herbaceous plants

* soil preparation, amendment, and testing

5) knowledge of landscape design and construction techniques

comprises the related, but more specific, skills:

* site mapping, surveying, and drafting

* interpretation of landscape drawings

* selection, installation, and maintenance of landscape construction materials (i.e., retaining walls and pavings)

6) knowledge of basic management skills

comprises the related, but more specific, skills:

* preparation of budgets and forecasting of costs

* project management and supervision

* effective communication (oral and written) with colleagues and the public

* management of time

7) knowledge and use of horticultural reference materials

comprises the related, but more specific, skills:

* familiarity with botanical and horticultural literature (i.e., magazines and journals)

* use of plant keys

To summarize the above discussion, administrators, supervisors, and gardeners, believe the following skills are most important for gardeners:

* selection, handling and use of horticultural products (2)

* handling, use and general care of horticultural equipment (3)

Those areas they feel are important, though not quite as important as the two listed above are:

* identification, selection and care of ornamental plant material (excluding the

identification and care of turfgrass and non-hardy plants) (1)

* knowledge of basic management skills (excluding preparation of budgets and forecasting of costs, and project management and supervision) (6)

* knowledge of basic horticulture techniques (excluding propagation of woody and herbaceous plants) (4)

The horticultural areas that are currently least important for gardeners based on my survey results are:

* knowledge of landscape design and construction techniques (5)

* knowledge and use of horticultural reference materials (7)

Currently, the selection, handling and use of horticultural products and the handling, use and general care of horticultural equipment are well addressed by the curricula of the gardener training programs that I studied. Longwood's PGTP, however, is the only program that presently requires students to take a course on equipment maintenance; "Machinery and Equipment Maintenance" (see Appendix J).

All programs covered the identification, selection and care of ornamental plant materials through a variety of plant identification courses (see Appendices J, K and L).

Knowledge of basic management skills receives the most treatment from The NPC's School of Horticulture. Both the NYBG's School of Horticulture and Longwood Gardens' Professional Gardener Training Program offer students limited formal coursework on basic management concepts.

"Effective communication (oral and written) with colleagues and the public", one of the skills comprising the "knowledge of basic management" horticultural area, is given the most thorough attention by The Niagara Parks Commission's School of Horticulture; three oral reports, and three written field trip papers are required. In addition, a course in English is required in each year of study. Emphasis on written communications is stressed during the first two years in the form of assigned essays and business correspondences. Third year students concentrate on developing and polishing oral communication skills (see Appendix K).

The New York Botanical Garden's School of Horticulture program is currently the only program which does not address public speaking for gardeners; no oral presentations are required of their students.

Knowledge of basic horticultural techniques is also covered very well by all programs studied through a variety of horticultural techniques courses. Students also receive practical instruction of horticultural skills from program and garden staff during hands-on work sessions.

Gardener training programs address very well the general horticultural area knowledge of landscape design and construction techniques. The most intensive handling of landscape design comes from The NPC's School of Horticulture, requiring six courses in, or pertaining to, landscape design (see Appendix K).

Interestingly enough, the least highly rated general horticultural area, knowledge and use of horticultural reference materials, is well emphasized by all programs studied through a variety of Botany and Taxonomy courses.

2. Practical Field Requirements

Over four-thousand hours of practical field work, the most of any professional gardener training program I studied, is required of students enrolled in The Niagara Parks Commission's School of Horticulture. Third-year

students spend a ten-week practicum with the Niagara Parks Commission's Horticultural Department in Niagara Falls, Ontario. During this practicum, students are treated as regular staff members, have the opportunity to observe on-the-job horticultural and management techniques, and have the opportunity to reinforce management concepts they may have learned in class. As mentioned in Chapter I, third-year students also participate in a one-month "foremanship" of the School campus.

Students of The New York Botanical Garden's School of Horticulture have an option to spend a self-arranged three-month internship at a horticultural institution during July, August, and September of their first year. Currently, this is the only program that allows students this option. Students are responsible, however, for course work required at the Garden during this period, and funding of internships is the sole responsibility of the students electing to take this option.

From a management perspective, the hands-on training that students of The NPC's School of Horticulture receive most closely approximates the kind of training public institutions believe gardeners need. The ability

to organize and implement projects, a highly desirable skill for gardeners, is effectively handled by each students one-month "foremanship". Basic concepts of project management, supervision, and personnel relations are enhanced as students are challenged to coordinate not only their own activities, but the activities of others, as well.

I would like to point out, however, that practical experience of this kind may result from the rather unique circumstances under which the Niagara Parks Commission's School of Horticulture operates. While The NYBG's School of Horticulture, and Longwood Gardens' PGTP operate within the larger frameworks of their supporting institutions, the NPC's School of Horticulture works largely within the context of its own campus. With the exception of a ten-week summer practicum for third-year students, and several courses that require plant study in Commission greenhouses, the practical components of the School center around the 100 acre grounds. By maintaining direct control over the daily operations of their campus, the School can more easily provide practical learning experiences that are valuable for their students.

Quite the opposite can occur when the coordination of activities must be carried out within the parameters set by large, sometimes cumbersome, organizational schemes. Both Longwood Gardens and The New York Botanical Garden fall into this category, providing students with hands-on experience that rotates them through a variety of garden areas. From my research, I believe the problem with this approach is that garden staff are usually quite reluctant to give students the opportunity to make decisions in planning and implementing work that would be helpful to them in the long run.

As a result, they are generally assigned to work which is purely physical (e.g., hand weeding, planting out bedding plants that have already been placed in their exact landscape locations) in nature. This may be good from a horticultural practices standpoint, but is rather poor from the standpoint of teaching students basic management concepts as future gardening professionals. It is one thing to plant out a bed of annuals, and quite another to conceptualize the display, plan the number of plants to sow from seed, organize the time required to install the planting, and coordinate necessary personnel to make the design a reality.

While many may argue that gardeners are not supposed to manage, my research has determined that students are all too often expected to manage basic work projects soon after they take their first horticultural position following graduation. How will they effectively obtain training of this kind if it is not forthcoming from professional gardener training programs?

The NPC's School of Horticulture program offers students the most extended field trip away from the School's grounds -- two weeks. Taken during the spring of the third year, students may choose to spend up to two weeks travelling in North America or abroad, visiting horticultural institutions of merit. Funding for this field trip, however, is the responsibility of each student. Both Longwood's PGTP and the NYBG's School of Horticulture provide field trips to a variety of horticultural institutions (see Appendix M.).

Field trips offer students valuable opportunities to explore both public and private horticultural institutions. They also expose them to many horticultural professionals that may one day provide them with future employment opportunities.

The elements that I have discussed in this chapter highlight the major differences between the professional gardener training programs that I examined. For major program similarities, I urge the reader to examine the information contained in Appendix M.

CHAPTER III

RECOMMENDATIONS FOR PROFESSIONAL GARDENER TRAINING PROGRAMS

Designing professional gardener training programs that meet all student needs -- and the requirements of their eventual employers -- is difficult. Training programs, by nature, are designed to address the specific needs of the organization or industry they serve. Periodically, these needs must be examined to assess how well current training methodologies are satisfying intended objectives.

Based on the results of my survey, a training model can be constructed which reflects the skills public institutions desire of gardeners. In its most basic form, this model includes all of the "critical" and "desirable" horticultural skills and basic management abilities that administrators, supervisors, and gardeners feel that gardeners working in their public institutions should have.

As stated in Chapter II, the general horticultural areas that today are most critical for the training of professional gardeners (in order of importance), are:

* selection, handling and use of horticultural products (pesticides, fertilizers and mulches)

* handling, use and general care of horticultural equipment (hand tools, small and large equipment)

Slightly less important than the above, but nevertheless desirable for inclusion in gardener training programs, are (in order of importance):

* identification, selection and care of ornamental plant material (especially annuals, perennials, trees, shrubs, vines and tropical plants)

* knowledge of landscape design and construction techniques (especially interpretation of landscape drawings and landscape construction materials)

* knowledge of basic horticultural techniques (especially pruning and soil preparation)

In addition, my survey also revealed that administrators, supervisors, and gardeners of public institutions regard certain basic management abilities to be important for gardeners, as well as their supervisory personnel. Among those that are most highly regarded for gardeners are:

* the ability to effectively manage time
* the ability to organize and implement projects
* the ability to communicate effectively

Simply structuring a professional gardener training program around a list of desired skills is not enough, however. Other factors, like the ratio between in-class training and hands-on work experience, overall program length, and program resources all play a part in determining how these programs can most effectively train students to become professional gardeners. All of the programs that I examined utilize certain training elements that make them singularly unique. I believe there are effective elements in each program that are conducive to student learning. I also believe that some elements of training are of questionable value for students. Given the framework various institutions must operate under, some elements may not be possible for all programs in all situations.

Bases on my own personal observations, and the results of my survey of public institutions that employ gardeners, I believe that in addition to providing student gardeners with the training that employers want, the following elements should be included in professional

gardener training programs whenever possible:

* longer blocks of time for practical in-garden work experiences. A four-day practical/one-day classroom ratio is recommended from April to September, to provide more valuable work experience during periods of peak outdoor activity, and to enable students to have greater opportunities for valuable basic management experiences. The practical work days should be consecutive to be most effective

* structure academic course work to coincide with slow work periods outdoors. A four-day classroom/one-day practical ratio is recommended from October to March. Classroom days need not be consecutive. Occasional evening lectures are encouraged to relieve the tedium of daily classes

* provide written and oral assignments to develop and sharpen communication skills. Academic courses in both written and oral communications should be incorporated to provide technical training in these areas

* add a third year to programs under three years in length. The third year should prepare students for entry into the work force, and should emphasize basic management training. It is recommended that third-year students be given greater supervisory responsibility for the work of other students during this time, and should be allowed to "manage" small public garden areas for set periods of time

* provide students with three-month internship opportunities at other horticultural institutions. Internships should preferably be taken during a students second or third years

* provide housing and/or stipends to compensate students for the practical work they do for each institution. On-site housing is preferred whenever possible

How well are existing professional gardener training programs "measuring up" to my model based upon the needs of public institutions? In my opinion, The Niagara Parks Commission's School of Horticulture is most effectively preparing students for careers in public institutions at the present time. Their gardener training program effectively balances practical and academic work, and gives students the kinds of basic management tools they will require as they pursue careers in the field of horticulture.

This is not to say that other programs lack effective methods for training gardeners. Based on my observations, and the admissions from public institutions that employ gardeners, the most "ideal" gardener training program would incorporate all, or as many as possible, of the elements that I have mentioned.

Although the focus of my research has been on the needs of public, not-for-profit institutions, many of my findings can be applied to private and commercial horticultural establishments, as well. This information is useful in:

* writing job descriptions for gardeners
* designing horticultural in-service training

programs

* evaluating the abilities of staff gardeners

Serving the needs of public horticulture is but one segment of horticulture that requires the expertise of professional gardeners. If professional gardener training programs are to provide qualified gardeners for entry into the private and commercial as well as public horticulture, further surveys will be necessary to effectively assess which gardener skills are most valuable for gardeners employed in, or seeking to work in, those industries.

APPENDIX A

Public Institutions Selected for the Survey

APPENDIX A

Arizona - Sonora Desert Museum, Incorporated
2021 North Kinney Road
Tuscon, AZ 85743

The Arnold Arboretum of Harvard University
The Arborway
Jamaica Plain, MA 02130

Atlanta Botanical Garden
P.O. Box 77246
Atlanta, GA 30357

Bayard Cutting Arboretum
Box 466 Montauk Highway
Oakdale, NY 11709

The Biltmore Company
1 North Pack Square
Asheville, NC 28801

Birmingham Botanical Gardens
2612 Lane Park Road
Birmingham, AL 35223

Boerner Botanical Garden
5879 South 92nd Street
Hales Corners, WI 53130

Bok Tower Gardens
P.O. Box 3810
Lake Wales, FL 33859

Brookgreen Gardens
Murrells Inlet, SC 29576

Brooklyn Botanic Garden
1000 Washington Avenue
Brooklyn, NY 11225

Brookside Gardens
1500 Glenallen Avenue
Wheaton, MD 20902

Buffalo Zoological Garden
Delaware Park
Buffalo, NY 14214

Busch Gardens
Williamsburg, VA 23187

Butchart Gardens
Box 4010 Postal Station A
Victoria, BC
Canada V8X 3X4

Calgary Zoo and Botanical Garden
P.O. Box 3036 Station B
Calgary, AB
Canada T2M 4R8

Callaway Gardens
US Highway 27
Pine Mountain, GA 31822

Chicago Botanic Garden
P.O. Box 400
Glencoe, IL 60022

Chicago Zoological Society
3300 Golf Road
Brookfield, IL 60513

Cincinnati Zoo
3400 Vine Street
Cincinnati, OH 45220

Colonial Williamsburg
Williamsburg, VA 23187

Cornell Plantations
100 Judd Falls Road
Ithaca, NY 14850

The Crosby Arboretum
3702 Hardy Street
Hattiesburg, MS 39401

Cypress Gardens
P.O. Box One
Winterhaven, FL 33880

The Dawes Arboretum
7770 Jacksontown Road, SE
Newark, OH 43055

Denver Botanic Garden
909 York Street
Denver, CO 80206

Devonian Botanical Garden
University of Alberta
Edmonton, AL
Canada T6G 2E9

Disneyland
1313 Harbor Boulevard
Anaheim, CA 92803

Desert Botanical Garden
1201 North Galvin Parkway
Phoenix, AZ 85008

The Dow Gardens
1018 West Main Street
Midland, MI 48640

Fairchild Tropical Garden
10901 Old Cutler Road
Miami, FL 33156

Filoli Center
Canada Road
Woodside, CA 94062

Garden in the Woods
Hemenway Road
Framingham, MA 01701

Hawaii Tropical Botanical Garden
P.O. Box 1415
Hilo, HI 96720

Holden Arboretum
9500 Sperry Road
Mentor, OH 44060

Huntington Botanic Garden
San Marino, CA 91108

Kingwood Center
900 Park Avenue West
Mansfield, OH 44906-2999

Longwood Gardens
P.O. Box 501
Kennett Square, PA 19348

Missouri Botanical Garden
P.O. Box 299
St. Louis, MO 63166

Morris Arboretum
9414 Meadowbrook Avenue
Philadelphia, PA 19118

Morton Arboretum
Route #53
Lisle, IL 60532

Marie Selby Botanical Garden
800 South Palm Avenue
Sarasota, FL 33577

Matthaei Botanical Gardens
1800 North Dixboro Road
Ann Arbor, MI 48105

Metropolitan Toronto Zoo
P.O. Box 280 West Hill
Toronto, ON
Canada M1E 4R5

Montreal Botanic Garden
4104 East Rue Sherbrooke
Montreal, PQ
Canada H1X 2B2

Mt. Cuba Center
P.O. Box 3570
Greenville, DE 19807

Nebraska Statewide Arboretum
112 Forestry Science Laboratory
University of Nebraska
Lincoln, NE 68583-0823

Norfolk Botanical Gardens
Airport Road
Norfolk, VA 23185

The New York Botanical Garden
Bronx, NY 10458

North Carolina Botanical Gardens
University of North Carolina
Box 3375 Totten Center
Chapel Hill, NC 27514

North Carolina State University Arboretum
Box 7609
Raleigh, NC 27695-7609

Old Sturbridge Village
1 Old Sturbridge Village Road
Sturbridge, MA 01566

Pacific Tropical Botanical Garden
P.O. Box 340
Lawai, Kauai, HI 96765

Planting Fields Arboretum
P.O. Box 58
Oyster Bay, NY 11771

Queens Botanical Garden Society
43-50 Main Street
Flushing, NY 11355

Rancho Santa Ana Botanical Garden
1500 North College Avenue
Claremont, CA 91711

Royal Botanical Garden
Hamilton, ON
Canada L8N 3H8

San Diego Wild Animal Park
15500 San Pasqual Valley Road
Escondido, CA 92027-9614

San Diego Zoological Gardens
Box 551
San Diego, CA 92112-0551

Santa Barbara Botanic Garden
1212 Mission Canyon Road
Santa Barbara, CA 93105

San Antonio Botanical Center
555 Funston Place
San Antonio, TX 78209

Scott Arboretum of Swarthmore College
Swarthmore College
Swarthmore, PA 19081

Sonnenberg Gardens
Box 496
Canandaigua, NY 14424

Strybing Arboretum
9th Ave.
Lincoln Way
San Francisco, CA 91422

Toledo Zoological Society
2700 Broadway
Toledo, OH 43609

University of British Columbia Botanical Garden
6501 Northwest Marine Drive
Vancouver, BC
Canada V6T 1W5

University of Minnesota Landscape Arboretum
3075 Arboretum Drive
Chanhassen, MN 55317

University of California Arboretum
Davis
Davis, CA 95616

The United States Botanic Garden
245 1st Street, Southwest
Washington, D.C. 20024

United States National Arboretum
3501 North York Avenue
Washington, D.C. 20002

Van Dusen Botanical Garden
5215 Oak Street
Vancouver, BC
Canada V6M 4H1

Walt Disney World
P.O. Box 10,000
Lake Buena Vista, FL 32830-1000

Wave Hill
675 West 252nd Street
Bronx, NY 10471

Woodland Park Zoological Gardens
5500 Phinney Avenue North
Seattle, WA 98103

Winterthur Museum and Gardens
Gardens Division
Route 52
Wilmington, DE 19735

APPENDIX B

My Survey Definition of a "Gardener"

** A GARDENER shall be defined as an individual who, under the direct supervision of a Foreman, Section-Head, or other first-line supervisor, is responsible for the routine planting and maintenance activities of assigned or general areas within a public Botanical Garden, Arboretum, Zoological Garden, or other public institution that grows, exhibits, and maintains plants for purposes of education, aesthetics, enjoyment, or recreation.*

APPENDIX C

Sample Letter Sent to "Administrators"

UNIVERSITY OF DELAWARE
NEWARK, DELAWARE
19717-1303

THE LONGWOOD GRADUATE PROGRAM
In Public Horticulture Administration
302/451-2517
153 Townsend Hall

September 15, 1987

Mr. William Shellburne
Director of Horticulture
Busch Gardens
Williamsburg, VA 23185

Dear Mr. Shellburne,

*As an Administrator of a public Botanical Garden, Arboretum, or Zoological Garden, I am sure you can sympathize with the reality of having to accomplish more work with fewer employees. I am interested in determining which horticultural skills and abilities YOU feel are important for YOUR institution's professional *GARDENERS to have, upon entering a gardener's position. Based upon the information which institutions such as yours will provide, a comparison will be made of current curricula and hands-on training being provided in various professional gardener training programs to find out if the perceived needs of professional gardeners for public horticultural institutions are being met. By professional gardener training program, I mean a formally administered program which grants successful graduates a certificate or diploma rather than a collegiate degree.*

Your institution is one of a select number of Botanical Gardens, Arboreta, and Zoological Gardens in the United States and Canada that has been chosen based, in part, upon the relative size of your horticultural staff. To enable me to make a better recommendation for gardener training programs, I am directing questionnaires to three distinct horticultural levels; ADMINISTRATOR (Director, Superintendent, etc.), SUPERVISOR (Foreman, Section-Head, etc.), and GARDENER (Groundskeeper, etc.). I am requesting that you fill out and return the WHITE questionnaire, give the YELLOW questionnaire to the SUPERVISOR you feel best represents a first-line supervisor of gardeners, and instruct the supervisor to distribute the GREEN questionnaire to a representative GARDENER in his/her charge.

You and your staff may be assured of complete confidentiality. The questionnaires have identification numbers for mailing purposes only. This enables me to check off your institution's name at each of the various personnel levels as completed questionnaires are received. Your names will never appear on the questionnaires themselves, nor in the study results.

The results of this research will be made available to public Botanical Gardens, Arboreta, and other interested institutions that are currently developing or administering professional gardener training programs. you will receive three summary copies of the study results upon receipt by me of three completed questionnaires from your institution. Please return to me by OCTOBER 15, 1987.

I would be most happy to answer any questions you or your staff might have. Please write or call. I can be reached at (215) 388-2685 or (302) 451-1369.

Thank you very much for your assistance in this study.

Sincerely,

James A. Mack
Longwood Graduate Fellow
The Longwood Graduate Program in Public Horticulture Administration

**GARDENER is defined on the attached page*

APPENDIX D

Gardener Study Questionnaire

(Administrator)

Q-1. Please state the number of full time EMPLOYEES at your institution. ____

Q-2. Please state the number of full time GARDENERS that your institution employs. ____

Q-3. Please indicate, in U.S. dollars, the relative range of your institutions annual operating budget. (excluding capital expenditures)

a) less than $200,000 ____
b) $200,001 - 500,000 ____
c) $500,001 - 700,000 ____
d) $700,001 - 1,000,000 ____
e) more than $1,000,000 ____

Q-4. As a general policy in hiring GARDENERS, what level of training and experience does your institution require? (check all that apply)

a) associates degree (2 - year) ____
b) bachelors degree (4 - year) ____
c) a certificate/diploma in hort. ____
d) no formal training in horticulture ____
e) other (i.e. on-the-job experience) ____

_____

Q-5. Do you feel the overall qualifications required of GARDENERS by Public Garden Administrators have changed significantly in the past 10 years?

a) Yes ____
b) No ____

5-a) If yes, in what ways? (use back of page if necessary)

Q-6. As a matter of practice, does your institution:

a) assign each GARDENER to a specific physical area ____
b) assign each GARDENER to a specified set of jobs ____
c) assign each GARDENER where needed at the time ____

Q-7. Select the level of horticultural expertise which GARDENERS at your institution have BROUGHT to their entry-level positions within the past 10 years.

a) no horticultural competence ____
b) competent to perform most general horticultural practices ____
c) competent to perform specialized horticultural practices only (i.e. Arboriculture, Turf care) ____

Q-8. When considering the qualifications of candidates for GARDENER positions, indicate by circling the degree of importance which YOU place on the following skills:

critical = 1
desirable = 2
not important = 3

		Degree of Importance
a)	identification, selection and care of annuals and herbaceous perennials	1 2 3
b)	identification, selection and care of trees, shrubs, and vines	1 2 3
c)	identification and care of turfgrasses	1 2 3
d)	identification and care of non-hardy plants (i.e. tropical conservatory plants)	1 2 3
e)	selection, handling, and use of pesticides	1 2 3
f)	selection, handling, and use of fertilizers	1 2 3
g)	selection, handling, and use of mulches	1 2 3
h)	handling, use, and general care of HAND TOOLS (rakes, shovels, pruners, etc...)	1 2 3
i)	handling, use, and general care of SMALL power equipment (chainsaw, rototiller, line trimmer, etc...)	1 2 3
j)	handling, use, and general care of LARGE power equipment (tractor, dump truck, riding lawn mower, etc...	1 2 3

k)	proper pruning techniques	1	2	3
l)	propagation of woody and herbaceous plants (asexual and sexual)	1	2	3
m)	soil preparation, amendment, and testing	1	2	3
n)	site mapping, surveying, and drafting	1	2	3
o)	interpretation of landscape drawings	1	2	3
p)	selection, installation, and maintenance of landscape construction materials (retaining walls, pavings, etc...	1	2	3
q)	preparation of budgets and forecasting of costs	1	2	3
r)	project management and supervision	1	2	3
s)	effective communication (oral and written) with colleagues and the public	1	2	3
t)	management of time	1	2	3
u)	familiarity with botanical and horticultural literature (magazines and journals)	1	2	3
v)	use of plant keys	1	2	3

Q-9. Approximately how many GARDENER positions do you expect to fill in the next FIVE years?

a) 0 ____
b) 1 - 5 ____
c) 6 - 9 ____
d) 10 - 19 ____
e) 20 or more ____

Q-10. Does your institution provide any in-service training programs for its GARDENERS conducted by in-house staff?

a) Yes ____
b) No ____

10-a) If YES, please explain, or attach a copy of any document you may have which outlines this training.

10-b) If NO, does your institution plan to provide any in-service training programs for its GARDENERS conducted by in-house staff within the next 5 years?

a) Yes ____
b) No ____

10-c) If YES to 10-b), please explain what this training program would entail.

Q-11. Rank the skills listed below in order of importance to you as an administrator for your SUPERVISORS to have. (from 1 to 7)

example: 1 = most important attribute
7 = least important attribute

a) ability to supervise and motivate others ____
b) ability to effectively manage time ____
c) ability to communicate effectively with colleagues and the public ____
d) ability to predict project needs ____
e) ability to organize and implement projects ____
f) ability to manage conflicts ____
g) ability to manage finances ____

11-a) Of the skills cited in Q-11, which do YOU feel are the top 3 for your GARDENERS to possess, in order of most important first.

a) most important ____
b) second most important ____
c) third most important ____
d) none of the above are important ____

Q-12. Has this survey raised any additional issues concerning the qualifications and need for training of gardeners? Please respond in space below.

APPENDIX E

Sample Letter Sent to "Supervisors"

UNIVERSITY OF DELAWARE
NEWARK, DELAWARE
19717-1303

THE LONGWOOD GRADUATE PROGRAM
in Public Horticulture Administration
302/451-2517
153 Townsend Hall

Dear SUPERVISOR, *September 15, 1987*

*I am interested in determining which skills and abilities YOU, as a Supervisor of *GARDENERS, feel are important for YOUR institution's professional gardeners to have, upon entering a gardener's position. Based upon the information which Supervisors like yourself will provide, a comparison will be made of current curricula and hands-on training being provided in various professional gardener training programs to find out if the perceived needs of professional gardeners for public horticultural institutions are being met. By professional gardener training program, I mean a formally administered program which grants successful graduates a certificate or diploma rather than a collegiate degree.*

Your institution is one of a select number of Botanical Gardens, Arboreta, and Zoological Gardens in the United States and Canada that has been chosen based, in part, upon the relative size of your horticultural staff. To enable me to make a better recommendation for gardener training programs, I am directing questionnaires to three distinct horticultural levels; ADMINISTRATOR (Director, Superintendent, etc.), SUPERVISOR (Foreman, Section-Head, etc.), and GARDENER (Groundskeeper, etc.). I am requesting that you fill out and return the YELLOW questionnaire, and give the GREEN questionnaire to the GARDENER in your charge, regardless of his/her formal education or training, that you feel is most representative of gardeners in general at your institution.

You may be assured of complete confidentiality. The questionnaires have identification numbers for mailing purposes only. This enables me to check off your institution's name at each of the various personnel levels as completed questionnaires are received. Your name will never appear on the questionnaire itself, nor in the study results.

The results of this research will be made available to public Botanical Gardens, Arboreta, and other interested institutions that are currently developing or administering professional gardener training programs. Copies of the results will be mailed to your institution's Administrator upon receipt by me of three completed questionnaires from your institution. Please return to me by OCTOBER 15, 1987.

I would be most happy to answer any questions you may have. Please write or call. I can be reached at (215) 388-2685 or (302) 451-1369.

Thank you very much for your assistance in this study.

Sincerely,

James A. Mack

James A. Mack
Longwood Graduate Fellow
The Longwood Graduate Program in Public Horticulture Administration

**Gardener is defined on the attached page*

APPENDIX F

Gardener Survey Questionnnaire

(Supervisor)

Q-1. As a matter of practice, do you:

a) assign each GARDENER to a specific physical area ____
b) assign each GARDENER to a specified set of jobs ____
c) assign each GARDENER where needed at the time ____

Q-2. Do you feel the overall expectations of GARDENERS by public garden Supervisors and/or Administrators have changed significantly in the past 10 years?

a) Yes ____
b) No ____

2-a) If yes, in what ways? (use back of page if necessary)

Q-3. Select the level of horticultural expertise which GARDENERS at your institution have BROUGHT to their entry-level positions within the past 10 years.

a) no horticultural competence ____
b) competent to perform most general horticultural practices ____
c) competent to perform specialized horticultural practices only (i.e. Arboriculture, Turf care) ____

Q-4. When considering the qualifications of candidates for GARDENER positions, indicate by circling the degree of importance which YOU place on the following skills:

critical = 1
desirable = 2
not important = 3

		Degree of Importance
a)	identification, selection and care of annuals and herbaceous perennials	1 2 3
b)	identification, selection and care of trees, shrubs, and vines	1 2 3
c)	identification and care of turfgrasses	1 2 3
d)	identification and care of non-hardy plants (i.e. tropical conservatory plants)	1 2 3

e)	selection, handling, and use of pesticides	1	2	3
f)	selection, handling, and use of fertilizers	1	2	3
g)	selection, handling, and use of mulches	1	2	3
h)	handling, use, and general care of HAND TOOLS (rakes, shovels, pruners, etc...)	1	2	3
i)	handling, use, and general care of SMALL power equipment (chainsaw, rototiller, line trimmer, etc...)	1	2	3
j)	handling, use, and general care of LARGE power equipment (tractor, dump truck, riding lawn mower, etc...	1	2	3
k)	proper pruning techniques	1	2	3
l)	propagation of woody and herbaceous plants (asexual and sexual)	1	2	3
m)	soil preparation, amendment, and testing	1	2	3
n)	site mapping, surveying, and drafting	1	2	3
o)	interpretation of landscape drawings	1	2	3
p)	selection, installation, and maintenance of landscape construction materials (retaining walls, pavings, etc...	1	2	3
q)	preparation of budgets and forecasting of costs	1	2	3
r)	project management and supervision	1	2	3
s)	effective communication (oral and written) with colleagues and the public	1	2	3
t)	management of time	1	2	3
u)	familiarity with botanical and horticultural literature (magazines and journals)	1	2	3
v)	use of plant keys	1	2	3

Q-5. Does your institution provide any in-service training programs for its GARDENERS conducted by in-house staff?

a) Yes ____
b) No ____

5-a) If YES, please explain, or attach a copy of any document you may have which outlines this training. (use back of page if necessary)

5-b) If NO, does your institution plan to provide any in-service training programs for its GARDENERS conducted by in-house staff within the next 5 years?

a) Yes ____
b) No ____

5-c) If YES to 5-b), please explain what this training program would entail. (use back of page if necessary)

Q-6. Rank the skills listed below in order of importance for you as a SUPERVISOR to have. (from 1 to 7)

example: 1 = most important attribute
7 = least important attribute

a) ability to supervise and motivate others ____
b) ability to effectively manage time ____
c) ability to communicate effectively with colleagues and the public ____
d) ability to predict project needs ____
e) ability to organize and implement projects ____
f) ability to manage conflicts ____
g) ability to manage finances ____

6-a) Of the skills cited in Q-6, which do YOU feel are the top 3 for your GARDENERS to possess, in order of most important first.

a) most important ____
b) second most important ____
c) third most important ____
d) none of the above are important ____

Q-7. Has this survey raised any additional issues concerning the qualifications and need for training of gardeners? Please respond in space below.

APPENDIX G

Sample Letter Sent to "Gardeners"

UNIVERSITY OF DELAWARE
NEWARK, DELAWARE
19717-1303

THE LONGWOOD GRADUATE PROGRAM
In Public Horticulture Administration
302/451-2517
153 Townsend Hall

Dear professional GARDENER. *September 15, 1987*

*I am interested in determining which skills and abilities YOU, as a professional *GARDENER, feel were important for YOU to have as you entered your current gardener's position. Based upon the information which professional gardeners like yourself will provide, a comparison will be made of current curricula and hands-on training being provided in various professional gardener training programs to find out if the perceived needs of professional gardeners for public horticultural institutions are being met. By professional gardener training program, I mean a formally administered program which grants successful graduates a certificate or diploma rather than a collegiate degree.*

Your institution is one of a select number of Botanical Gardens, Arboreta, and Zoological Gardens in the United States and Canada that has been chosen based, in part, upon the relative size of your horticultural staff. To enable me to make a better recommendation for gardener training programs, I am directing questionnaires to three distinct horticultural levels; ADMINISTRATOR (Director, Superintendent, etc.), SUPERVISOR (Foreman, Section-Head, etc.), and GARDENER (Groundskeeper, etc.). I am requesting that you fill out and return the GREEN questionnaire.

You may be assured of complete confidentiality. The questionnaires have identification numbers for mailing purposes only. This enables me to check off your institution's name at each of the various personnel levels as completed questionnaires are received. Your name will never appear on the questionnaire itself, nor in the study results.

The results of this research will be made available to public Botanical Gardens, Arboreta, and other interested institutions that are currently developing or administering professional gardener training programs. Copies of the results will be mailed to your institution's Administrator upon receipt by me of three completed questionnaires from your institution. Please return to me by OCTOBER 15, 1987.

I would be most happy to answer any questions you may have. Please write or call. I can be reached at (215) 388-2685 or (302) 451-1369.

Thank you very much for your assistance in this study.

Sincerely,

James A. Mack

James A. Mack
Longwood Graduate Fellow
The Longwood Graduate Program in Public Horticulture Administration

**Gardener is defined on the attached page*

APPENDIX H

Gardener Study Qestionnaire

(Gardener)

Q-1. Please indicate below your CURRENT level of training and/or experience as a GARDENER. (check all that apply)

a) associates degree (2 - year) ____
b) bachelors degree (4 - year) ____
c) a certificate/diploma in hort. ____
d) no formal training in horticulture ____
e) other (i.e. on-the-job experience) ____

_____

Q-2. Do you feel the overall qualifications and expectations of GARDENERS by public garden Supervisors and/or Administrators have changed significantly in the past 10 years?

a) Yes ____
b) No ____

2-a) If yes, in what ways? (use back of page)

Q-3. Indicate by circling the degree of importance which YOU place on the following skills as a professional GARDENER:

critical = 1
desirable = 2
not important = 3

		Degree of Importance		
a)	identification, selection and care of annuals and herbaceous perennials	1	2	3
b)	identification, selection and care of trees, shrubs, and vines	1	2	3
c)	identification and care of turfgrasses	1	2	3
d)	identification and care of non-hardy plants (i.e. tropical conservatory plants)	1	2	3
e)	selection, handling, and use of pesticides	1	2	3
f)	selection, handling, and use of fertilizers	1	2	3
g)	selection, handling, and use of mulches	1	2	3
h)	handling, use, and general care of HAND TOOLS (rakes, shovels, pruners, etc...)	1	2	3
i)	handling, use, and general care of SMALL power equipment (chainsaw, rototiller, line trimmer, etc...)	1	2	3

j)	handling, use, and general care of LARGE power equipment (tractor, dump truck, riding lawn mower, etc...	1	2	3
k)	proper pruning techniques	1	2	3
l)	propagation of woody and herbaceous plants (asexual and sexual)	1	2	3
m)	soil preparation, amendment, and testing	1	2	3
n)	site mapping, surveying, and drafting	1	2	3
o)	interpretation of landscape drawings	1	2	3
p)	selection, installation, and maintenance of landscape construction materials (retaining walls, pavings, etc...	1	2	3
q)	preparation of budgets and forecasting of costs	1	2	3
r)	project management and supervision	1	2	3
s)	effective communication (oral and written) with colleagues and the public	1	2	3
t)	management of time	1	2	3
u)	familiarity with botanical and horticultural literature (magazines and journals)	1	2	3
v)	use of plant keys	1	2	3

Q-4. Rank the skills listed below in order of importance to you as a professional gardener for SUPERVISORS to have. (from 1 to 7)

example: 1 = most important attribute
7 = least important attribute

a) ability to supervise and motivate others ____
b) ability to effectively manage time ____
c) ability to communicate effectively with colleagues and the public ____
d) ability to predict project needs ____
e) ability to organize and implement projects ____
f) ability to manage conflicts ____
g) ability to manage finances ____

4-a) Of the skills cited in Q-4 , which do YOU feel are the 3 most commonly used by yourself in everyday GARDENING activities? If NONE of the above abilities are used by you on a regular basis, simply indicate that none are important.

a) most important ____
b) second most important ____
c) third most important ____
d) none of the above are important ____

Q-5. Has this survey raised any additional issues concerning the qualifications and need for training of gardeners? Please respond in space below.

APPENDIX I

Sample Follow-up Post Card

September 29, 1987

Two weeks ago a questionnaire was mailed to your institution requesting information about the skills and abilities desired of Gardeners at Public Horticultural Institutions.

If you have already completed and returned YOUR "Administrator" copy, please accept my sincere thanks. If not, please take a few moments to do so today. I would appreciate your encouragement of appropriate staff to complete THEIR copies as soon as possible. It is extremely important that your institution's results be included in the final analysis of this study to ensure results that are as accurate as possible.

If by chance you have NOT received the questionnaire packet, or have misplaced it, please notify me immediately at (215-388-2685) or (302-451-2517) and I will mail you another. Thank you for your cooperation!

Sincerely,

James A. Mack

James A. Mack
Longwood Graduate Fellow

THE LONGWOOD GRADUATE PROGRAM
In Ornamental Horticulture

302/451-2517
153 Townsend Hall
University of Delaware
Newark, Delaware 19717-1303

* APPENDIX J

Required Course Listing and Course Descriptions of Longwood Gardens' Professional Gardener Training Program

* NOTE: Portions of the following have been extracted from "Longwood Gardens' Professional Gardener Training Program Instructors Manual," Longwood Gardens, Inc., March 1988. All course descriptions reflect my interpretation of their content, and are intended to fairly represent their subject matter in an easy to comprehend manner.

APPENDIX J

Courses

Annual Plants
Arboriculture I
Arboriculture II
Basic Botany
Botany II
Broad-leaved Evergreens
Conifers
Deciduous Shrubs
Deciduous Trees
Employment Procedures
Floral Design
Floriculture-Crop Study
Fruit Culture
Greenhouses and Related Structures
Ground Covers
Herbaceous Ornamental Plant Project
Indoor Plant Study
Landscape Construction
Advanced Landscape Design
Basic Landscape Design
Machinery and Equipment Maintenance
Supervisory Concepts
Oral Presentations
Ornamental Plant Laboratory
Perennial Flowers
Plant Pest Management I
Plant Pest Management II
Plant Propagation
Research Papers
Small Flowering Trees
Soils
Turfgrass Management
Vegetable Garden Orientation

Vegetable Production

Course Descriptions

Annual Plants: The identification, use, and culture of a group of ornamental annual and biennial plants.

Arboriculture I: A professional approach to tree care to include safely working with ropes, equipment, and machinery, proper use of equipment, pruning, recognizing hazards, climbing and tree evaluation.

Arboriculture II: A continuation of Arboriculture I with more emphasis of hands-on experience in pruning, climbing, cabling, lightning protection, spraying, fertilizing, and removal.

Basic Botany: A beginning foundation of principles of Botany. The study of the structures, growth, and functions of plants.

Botany II: Advanced Botany with some in-depth study of plant structures, including the principles of genetics and plant breeding techniques.

Broad-leaved Evergreens: The identification, use, and culture of more than 45 broad-leaved evergreens.

Conifers: The identification, use, and culture of 80 needled evergreens.

Deciduous Shrubs: The identification, use, and culture of more than 45 hardy ornamental shrubs.

Deciduous Trees: The identification, culture, and use of over 60 deciduous trees.

Employment Procedures: Group discussions involving opportunities in horticulture and the job market, career preparation, interviewing techniques, and preparation of a resume and cover letter.

Floriculture-Crop Study: An introduction to Floriculture and the important crops with practical growing experiences with bedding plants (including vegetables) and foliage crops.

Fruit Culture: A study of fruit production in temperate climates. Tree, bramble, vine, bush fruits, and strawberries will be covered.

Greenhouses and Related Structures: The study of various plant growing structures, and their management.

Ground Covers: The identification, use, and culture of a wide variety of hardy, ornamental ground covers.

Herbaceous Ornamental Plants Project: Students plan and implement an herbaceous ornamental plant design, and keep records of all costs, procedures, plant materials, and maintenance (covers two growing seasons).

Indoor Plant Study: The identification, classification, culture, and uses of tropical, sub-tropical, and xerophytic plants.

Landscape Construction: Basic concepts, materials, and methodologies for the use and construction of landscape features. Pavings, fencing, retaining walls, field measurement, grading, and cost estimating are all topics covered in this course.

Basic Landscape Design: The principles and theories of landscape design using plants and related material to create aesthetically pleasing landscapes. The use of tools and equipment required of a landscape designer.

Advanced Landscape Design: A continuation of an exposure to the aesthetic and technical aspects of landscape design presented in the preceding course, Basic Landscape Design.

Machinery and Equipment Maintenance: The principles of the internal combustion engine and familiarization with machinery, equipment and tools. Students will disassemble and reassemble, in groups of two, a small 4-cycle engine.

Supervisory Concepts: The use of effective communication in management; understanding employee motivation, and the ability to manage people properly.

Oral Presentations: Students learn public speaking by presenting three 30-minute talks using the group as an audience. Presentations are video taped and played back as a critique.

Ornamental Plant Laboratory (Re: Plant Walks): Discussions and tours emphasizing the observation of plants during various seasons of the year and with different climatic conditions.

Perennial Flowers: The identification, culture, and landscape use of more than 40 of the best perennials for the Delaware Valley.

Plant Pest Management I: The recognition and control of plant pests. Integrated management is discussed. The principles of safety in using pesticides are stressed.

Plant Pest Management II: The recognition and control of plant pests. Integrated management is discussed. The principles of safety in using chemical pesticides are stressed. Upon successful completion of the course, students receive a Pesticide Applicators Licence for Pennsylvania and Delaware.

Plant Propagation: The propagation of plants by sexual and asexual methods. Practical laboratory exercises will require students to grow plants using various propagation methods discussed in class.

Research Papers: Instruction and practical experience in writing. Two horticultural research papers are required during the Professional Gardener Training Program. Students are provided with a manual, and the instructor, the librarian, and other staff members are available for consultation.

Small Flowering Trees: The identification, use, and culture of more than 65 small ornamental trees.

Soils: A course that provides students with a basic knowledge of soils and soil fertility.

Turfgrass Management: A discussion of the principles and the familiarization of turfgrass establishment and maintenance.

Vegetable Garden Orientation: Provides a better understanding of the course Vegetable Production. Students are better prepared for this subsequent course through the lectures, open discussions, slides, laboratories, and demonstrations of this course.

Vegetable Production: The culture of vegetable crops to include planning, soil conditioning, planting, varietal selection, pest control, harvesting methods, and vegetable storage. During both summers, students plan and maintain individual vegetable gardens, and are evaluated and graded on them as a project.

* APPENDIX K

Required Course Listing and Course Descriptions of The Niagara Parks Commission's School of Horticulture

* NOTE: Portions of the following have been extracted from "The Niagara Parks Commission School of Horticulture Curriculum Guide," The Niagara Parks Commission School of Horticulture, 1988. Course descriptions reflect my interpretation of their content, and are intended to fairly represent their subject matter in an easy to comprehend manner.

APPENDIX K

Courses

Applied Arboriculture I
Arboriculture - Tree Maintenance II
Applied Entomology I
Applied Entomology II
Applied Entomology II - Insect Collection
Botany
Business - How to Start and Operate a Small Business
Effective Supervision and Motivation
English I
English II
English III
Field Trip Assignment - (First and Second year)
Field Trip - Third Year
Floriculture
Fruit Culture
Greenhouse Environment and Production I
Horticultural Chemicals
Horticultural Seminars I
Horticultural Seminars II
Introductory Soils I
Introductory Soils II
Landscape Design I - Plans
Landscape Design I - Rendering
Landscape Design II
Landscape Design III
Landscape Design III - Models
Land Surveying I
Mathematics Review
Plant Breeding and Seed Production
Plant Collections
Plant Collections II
Plant Pathology I
Plant Pathology II
Practical Greenhouse Course Outline (First, Second and

Third years)
Practical Horticulture Work Program
Practical Plant Identification I
Practical Plant Identification II
Practical Plant Identification III
Practical Work Program II
Practical Work Program III
Special Topics (Second and Third years)
Turf Grass Management
Vegetable Culture

Course Descriptions

Applied Arboriculture: Basic principles of arboriculture. Discussions on climbing and ropes, tree physiology, pruning, bracing, planting and transplanting, tree removal, and arboricultural equipment.

Arboriculture - Tree Maintenance II: Builds on the principles used in the preceding course (Applied Arboriculture), with increased emphasis on climbing. Discussions on tree fertilization, cavity work, wound tracing, diagnosis of tree vigor, and diagnosis and treatment of tree diseases.

Applied Entomology I: Basic examination of insects as biological organisms and their impact and importance on horticultural crops. Control measures, with particular emphasis on chemical controls, is addressed.

Applied Entomology II: The study of insects that effect horticultural plants. Recognition of these insects, the nature of the damage they inflict on plants, and methods of control are emphasized.

Botany: The fundamentals of plant biology, with special emphasis on structure and function of the plant systems and their relation to horticultural principles and practices.

Business - How to Start and Operate a Small Business: Various topics related to the creation and management of a small business.

Effective Supervision and Motivation: Principles and practice of supervising and motivating employees. Topics to be addressed include interviewing, performance appraisals, wage compensation, motivation, communication, trade unions, and safety and health benefits for employees.

English I: Basic concepts in writing of the English language. Emphasis is on the practice of written English and the skills necessary to produce an effective essay.

English II: Building on the written skills acquired in English I, emphasis is on essential strategies of writing business memoranda and other communications.

English III: Provides further applications of the skills acquired in English I and II, with an emphasis on oral communication skills. Topics include promotional writing, demonstration techniques, television experience, and speech delivery skill, including weekly oral critiques.

Field Trip Assignments: (First and Second Years) A one thousand word report written in a factual, comparative, and analytical manner on aspects of horticulture observed at specific sites of visitation.

Field Trip - Third Year: A two thousand word report written in a factual, comparative, and analytical manner on aspects of horticulture observed at specific sites of visitation. In addition, direct participation and involvement in the planning and implementation of this trip will be assessed each student during final grading.

Floriculture: An introduction to plant bedding designs and procedures, including techniques on the culture and maintenance of all types of bedding plants, inclusive of roses and perennials.

Fruit Culture: Basic concepts on fruit culture, with emphasis on various methods of commercial production. Grafting and pruning are covered in featured laboratory and field exercises.

Greenhouse Environment and Production I: An introduction to understanding the environmental factors that are related to plant growth. Topics include temperature, light transmission, humidity, water relations, greenhouse construction, and growth regulators. Excursions to several commercial greenhouse growers are taken.

Horticultural Chemicals: Various topics on the subject of chemical controls in the horticultural field. Topics include pesticide regulations, toxicity, classification of pesticides, and application methods for applying various pesticide formulations.

Horticultural Seminars I: Occurs during a student's second year. One 30-minute presentation on a horticultural subject. The horticultural subjects are assigned annually by the School staff, or are suggested by the student responsible for the seminar.

Horticultural Seminars II: Occurs during a student's third year. Two one-hour presentations on horticultural subjects. The subjects are assigned annually by the School staff, or are suggested by the student responsible for the seminar.

Introductory Soils I: An introduction to the origins and proper management of soil, with emphasis on soil properties. Topics include soil formation and classification, supply and availability of plant nutrients, organic matter in mineral soils, and liquid losses of soil water.

Introductory Soils II: Theoretical and practical considerations of organic soils and non-ideal soils, with special emphasis on soil fertility management as it relates to other soil factors. Topics include soil reactions, liming, micronutrients, and green manures.

Landscape Design I - Plans: An introduction to the general requirements, format, and conventions of documenting a plan or project for purposes of communicating with contractors or prospective clients.

Landscape Design I - Rendering: An introduction to the variety of communication skills that relate to landscape design. Emphasis is on the ability to communicate ideas visually with self and with others. Students draw everything from the human form through plant forms to architectural forms, employing a variety of techniques.

Landscape Design II: Builds on the concepts of Landscape Design I, with emphasis on the student's ability to relate sound design principles to the desires of the client. Both major and minor design projects are required.

Landscape Design III: Builds on the concepts learned in Landscape Design I and II, with emphasis on developing the qualities of perception, curiosity, problem solving, and clarity of thought. Both major and minor design projects are required.

Landscape Design III - Models: Consists of two parts: 1) a major landscape project of current, topical value, related to a major development presently taking place in the local community or immediate area whenever possible, and 2) preparation of a three-dimensional model that may or may not relate to the landscape project in the first half of the course.

Land Surveying I: An introduction to land surveying. Topics include types of surveys, units of measurement, methods of measurement, precision, accuracy, errors, field book format, levelling terms and techniques, profiles, cross-sections, and computations for areas and volumes.

Mathematics Review: A compulsory, non-credit course that ensures that students can solve routine computational problems. Topics are determined through an assessment of students' abilities upon entering the School of Horticulture.

Plant Breeding and Seed Production: The fundamental principles of genetics and plant breeding, and the methods involved in seed production and handling. Laboratory exercises and field trips compliment the topics covered. Basic tissue culture techniques are taught.

Plant Collections: An introduction to the methods of collecting and preserving plant specimens for an herbarium. Topics include the collecting of specimens, pressing methods, mounting methods, and recording and documentation.

Plant Collection II: A continuation of Plant Collections, with emphasis on the collection of assigned plant species for inclusion in the School of Horticulture herbarium.

Plant Pathology I: An introduction to the recognition and control of a specific number of pathological plant diseases.

Plant Pathology II: Builds on the concepts acquired in Plant Pathology I, with emphasis on the practical aspects of plant pathology. Diagnosis of pathological problems in plants, and appropriate treatments, is stressed.

Practical Greenhouse Course Outline: Occurs during the First, Second, and Third years of the program. Plant lists for greenhouse plant identification are supplied annually for all students. Year I students are responsible for plants marked I, Year II students for plants marked I and II, and year III students are responsible for the identification of all plants on the list. In addition, a number of greenhouse plant topics will be covered, including demonstrations propagation techniques, greenhouse environment and controls, plant nutrition, potting and transplanting, growing medias, diseases and pest control, winter storage techniques, and record keeping and growing schedules.

Practical Horticulture Work Program: Techniques, procedures, underlying theories and skills of the art of gardening. Topics also include safety and safety laws as well as the use of equipment and tools.

Practical Plant Identification I: An introduction to the identification of plants utilizing practical field methods. General identification features and descriptions, uses, culture, propagation, pests, and diseases, are covered through the use of both taxonomic classroom sessions, and outdoor walking tours.

Practical Plant Identification II: Builds on the knowledge acquired during Practical Plant Identification I. Special emphasis on the study of individual categories of plants such as native wild flowers and ferns, spring blooming vines, shrubs, and trees, roses, summer blooming vines, shrubs, and trees, and coniferous evergreen shrubs and trees. Plant keying, fruit types, and plant diagnosis is also featured.

Practical Plant Identification III: The identification of approximately 200 woody species of trees and shrubs in summer foliage and/or winter characteristics. Bark, twig, bud, seed, and fruit characteristics will be taught.

Practical Work Program II: Builds upon the skills acquired in the Practical Horticulture Work Program, and emphasizes the theory behind such practices. Initiation into foremanship training to develop supervision and scheduling experience.

Practical Work Program III: Building upon Practical Work Program II, emphasis is on people skills and the development of leadership qualities that will better prepare the student for positions of responsibility. Various topics are discussed, including development of organizational abilities, work evaluations, and assessing the human aspect of work relations. The third year experience working with The Niagara Parks Commission Horticultural Department off campus for ten weeks during the summer is also a part of this course.

Special Topics: An optional independent study course for second and third year students. A special project is selected in consultation with and under the supervision of the instructional staff.

Turf Grass Management: An introduction to the relationships that various climatic, topographical, and geographical influences exert on turf, as well as the establishment and maintenance of turf under various uses.

Vegetable Culture: An introduction to the numerous aspects of vegetable production, with emphasis on market gardening and home gardening.

* APPENDIX L

Required Course Listing and Course Descriptions of The New New York Botanical Garden's School of Horticulture

* NOTE: Portions of following have been extracted from "The New York Botanical Garden School of Horticulture 1983-85 Catalogue," volume V., July 1983, and the "Winter 1988 Catalogue," The New York Botanical Garden. Some course descriptions reflect my interpretation of their content, are intended to fairly represent their subject matter in an easy to comprehend manner.

APPENDIX L

Courses

Advanced Systematic Botany
Basic Botany
Commercial Greenhouse Management
Design Workshop
Diseases of Ornamental Plants
Entomology
Fertilizers
Graphics
Horticultural Techniques I
Horticultural Techniques II
Identification of Herbaceous Plants - Annuals
Identification of Herbaceous Plants - Bulbs
Identification of Herbaceous Plants - Perennials
Identification of Tropical Plants
Integrated Landscape Management of an Urban Park
Landscape Design I - Analysis and Schematic Design
Landscape Design II - Design and Development
Landscape Design III - Planting Design
Landscape Design Theory
Mathematics for Horticulturists (workshop)
Morphology of Flowering Plants
Nursery Management
Pesticide Certification
Plant Form and Function
Plant Physiology
Plant Propagation
Plant Propagation II
Pruning
Soil Science
Soil Testing
Surveying
Systematic Botany
Tree Climbing (workshop)
Tree Maintenance

Turf and Grounds Maintenance
Vegetable Gardening for the Professional Grower
Weeds
Woody Plant Identification - Broadleaved Evergreens
Woody Plant Identification - Conifers
Woody Plant Identification - Fall Trees and Shrubs
Woody Plant Identification - Spring Trees and Shrubs

Course Descriptions

Advanced Systematic Botany: Evolutionary history and relationships; importance of pollination systems to the systematics of flowering plants. Making and use of identification keys; identification by computer. Utilization of literature and herbarium resources.

Basic Botany: A survey of plant cells and tissues, cell division, reproduction, genetics, anatomy, systematics, evolution and ecology.

Commercial Greenhouse Management: Structures and equipment; automation; energy conservation; pollution. Crop scheduling. Management of heat, light, water and soil fertility; pest control. Market trends and the development of a market.

Design Workshop

Diseases of Ornamental Plants: Common diseases of woody and herbaceous ornamentals caused by bacteria, fungi, nematodes and viruses; cultural, biological and chemical strategies for disease control. Diagnosis of plant problems.

Entomology: Structure, growth and development of insects and related arthropods. Background to insect classification and identification; collection and preservation or insects.

Fertilizers: Fertilizer terminology; fertilizer programs for various crops; use of fertilizing equipment.

Graphics: Techniques of graphic expression. Use of drawing materials and drafting equipment; organization of plans for presentation and construction work. Studio course.

Horticultural Techniques I: Workshop course in basic operations for landscape horticulture. Soil preparation and planting; pruning, staking, training; water and fertilization practices; plant protection. Selection of tools and equipment. Emphasis on techniques used in commercial horticulture.

Horticultural Techniques II: A continuation of Horticultural Techniques I, with emphasis on greenhouse growing techniques. Soils and other growth media, potting, irrigation, fertilization, control of pests and diseases. Use and care of greenhouse equipment.

Identification of Herbaceous Plants - Annuals: A survey of annuals and selected perennials used in landscape plantings. Selection of low-maintenance plants is stressed.

Identification of Herbaceous Plants - Bulbs: A survey of spring, summer and autumn-flowering bulbs: biology, identification and ornamental characteristics.

Identification of Herbaceous Plants - Perennials: Recognition and landscape characteristics of ornamental herbaceous plants, including perennials, biennials, and selected garden annuals.

Identification of Tropical Plants: Identification, classification and culture of house and greenhouse plants.

Integrated Landscape Management of an Urban Park: Essential management concepts and procedures. Establishing priorities; using manpower and equipment resources; integrating landscape improvements. Specific programs relating to tree care, grounds management and public awareness.

Landscape Design I - Analysis and Schematic Design: Translation of programmatic and functional requirements

into a design concept; development of a schematic design. Studio course.

Landscape Design II - Design Development: Specific elements, materials and their relationships to the design process. Individual criticism and group discussion.

Landscape Design III - Planting Design: Basic design elements of planting; form, texture, color, sequence of bloom and ecological associations; planting for specific climates, topography and other natural situations. Emphasis on preparing planting plans, lists of appropriate plants and cost estimates.

Landscape Design Theory: Theories and principles that mold our attitudes towards the landscape. Survey of gardens, public spaces and the non-designed landscape.

Mathematics for Horticulturists (workshop): Methods of calculating applicatin rates for soil amendments, fertilizers, weed killers and other pesticides. Problems will be analyzed, and systems of estimating and checking results will be explained.

Morphology of Flowering Plants: An examination of the morphology, life history, distribution, and reproduction biology of plants placed into the group known as flowering plants.

Nursery Management: Principles of nursery management. Nursery site selection, arrangement and layout; growing nursery stock in the field and in containers; marketing.

Pesticide Certification: Safety practices; selection of pesticides; timing and scheduling of applications; environmental considerations; integrated pest management. Preparation for New York State Pesticide Applicator Certification examination, Category 3.

Plant Form and Function: Anatomy and physiology of plant cells and organs; cellular respiration and photosynthesis.

Plant Physiology: Plant growth and development, hormones, tropisms, phytochrome, dormancy, responses to low

temperature, flowering, senescence and abscission.

Plant Propagation: An introduction to the techniques of seed germination, hardwood and softwood cuttings, grafting, budding, layering and division of established plants; propagation of established plants; propagation of specialized stems and roots.

Plant Propagation II: Topics covered include: advanced seed propagation, grafting techniques, budding, and micropropagation.

Pruning: A workshop course on pruning ornamental trees, shrubs and vines. Training young stock; techniques for maintaining healthy plants; rejuvenation pruning. Selection, use and care of pruning tools and equipment. Special pruning techniques: espalier, topiary, wall plants.

Soil Science: Soil formation, soil profiles, soil water, physical properties of soil, organic matter, acidity, liming, mulches, sterilization, irrigation and drainage, nutrients, sampling and testing.

Soil Testing: Fertilizer recommendations; soil analysis; fertilizer types; fertilization practices for greenhouses, nurseries, container-grown plants, home landscape materials; nutrient requirements of plants.

Surveying: Linear and angular measurements, theory, units of error, elimination of error and applications; use of a compass, transit and theodolite; stadia; traversing methods and computations; mapping and map reading; topographic surveys; leveling.

Systematic Botany: A survey of the principles of angiosperm systematics. The role of plant anatomy, morphology, evolution, ecology and reproductive biology in plant classification. Special emphasis on modifications of floral structures.

Tree Climbing (workshop)

Tree Maintenance: Various techniques and procedures of tree care. Topics include: pruning, common tree problems, spraying, cavity installations, lightning protection, transplanting, fertilization of trees under stress, and root problems.

Turf and Grounds Maintenance: Professional management of ornamental plantings. Installation and maintenance of trees, shrubs, lawns and flower borders; pruning; pest control; winter protection; materials and equipment. Emphasis on efficient management of turf areas.

Vegetable Gardening for the Professional Grower

Weeds: Identification of weeds. Biology of weeds and their seeds; methods of control.

Woody Plant Identification - Broadleaved Evergreens: A survey of broadleaved evergreens, their identification and ornamental characteristics.

Woody Plant Identification - Conifers: Identification and landscape use of ornamental conifers. Review of winter identification of deciduous material.

Woody Plant Identification - Fall Trees and Shrubs: Identification and landscape use of ornamental trees and shrubs. Emphasis on shade trees and shrubs grown for ornamental foliage and fruit.

Woody Plant Identification - Spring Trees and Shrubs: A continuation of Woody Plant Identification: Fall Trees and Shrubs course, with emphasis on spring-flowering trees and shrubs.

* APPENDIX M

Professional Gardener Training Program Comparisons

* NOTE: Portions of the following have been extracted from the publications listed below. Some material reflects my interpretation of program content, and is intended to fairly represent each program in such a manner that the material is easy to comprehend. No personal favoritism for any particular program is intended through these comparisons, and all information provided is as factual and up-to-date as was possible just prior to printing this appendice.

"The New York Botanical Garden School of Horticulture 1983-85 Catalogue," Vol. V, July 1983.

"The Niagara Parks Commission School of Horticulture Curriculum Guide," The Niagara Parks Commission School of Horticulture, 1988.

"The Niagara Parks Commission School of Horticulture Prospectus, 1987" The Niagara Parks Commission School of Horticulture, 1987.

"Longwood Gardens Professional Gardener Training Program Instructors Manual," Longwood Gardens, Inc., March 1988.

"Professional Gardener Training Program at Longwood Gardens," Longwood Gardens, Inc., August 1987.

I. General Information

	The Niagara Parks Commission (NPC)	Longwood Gardens, Inc. (LWD)	The New York Botanical Garden (NYBG)
Name of Gardener Training Program:	The Niagara Parks Commission's School of Horticulture	Longwood Gardens' Professional Gardener Training Program	The New York Botanical Garden School of Horticulture
Name of Diploma Awarded:	Niagara Parks Diploma (NPD)	Diploma in Horticulture	Diploma in Horticulture
Program Objectives:	"to train apprentice gardeners in the practical and theoretical applications of horticulture"	"to train individuals to be gardeners suitable for employment in the fields of public and private ornamental horticulture"	"to train professional horticulturists who are skilled in the cultivation of plants and who qualify for leadership positions in the field of horticulture"
Location:	The Niagara Parks Commission's School of Horticulture, Niagara Falls, Ontario, Canada	Longwood Gardens, Kennett Square, Pennsylvania	The New York Botanical Garden, Bronx, New York
Length of Program:	36 consecutive months, beginning in mid-April of each year	24 consecutive months, beginning in March of even-numbered years	21 consecutive months, beginning in September of each year
Number of Students Accepted:	up to 12 annually	up to 14 in even-numbered years	up to 15 annually

	NPC	LWD	NYBG
Average Age of Students:	18 - 27	mid 20's	20's - 50's
Stipend:	1st yr. - $26 2nd yr. - $28 3rd yr. - $40 (CAN - weekly)	$200 (bi-weekly)	- 0 -
Tuition:	$1,950 (CAN)	- 0 -	$3,500
Fees: (i.e. books, supplies, deposits)	$1,325 (CAN)	$ 575	$ 500
Total Program Costs: (less refundable fees)	$2,675 (CAN)	$ 525	$4,000
Room/Board:	provided free of charge to 1st and 2nd yr. students on School campus	housing only is provided free of charge to students on the grounds of LWD	neither room nor board are provided for students
Vacations/Time Off:	* statutory holidays of NPC's permanent staff * 3 weeks, December - January * 1 week in April (3rd yr. students, only), OR * 1 week in August (1st and 2nd yr. students, only)	* statutory holidays of LWD permanent staff * 3 weeks, December - January * one-half day per month	* statutory holidays of NYBG permanent staff

	NPC	LWD	NYBG
Library	2,800+ books, vertical files, microfiche and microfilm, nursery and seed catalogues, college catalogues, horticultural periodicals, videotapes	17,000+ books, serials, pamphlets, vertical files, microfiche and microfilm, nursery and seed catalogues	800,000+ books, serials, archives, manuscripts, vertical files, microfilm and microfiche, nursery and seed catalogues, photographs, and botanical art
Herbarium	3,000+ specimens	7,000+ specimens	4.5 million specimens
Greenhouse/ Conservatory plant displays and collections -	*approximately 2,300 sq. ft. of production glasshouse and polyhouse space is available for student use on the School grounds *over 25,000 sq. ft. of production and display glasshouse space throughout the Niagara Parks Commission greenhouse complex	*no greenhouse space is currently allocated specifically for student use *nearly 4 acres under glass, featuring tropical, temperate, and arid plant species	*no greenhouse space is currently allocated specifically for student use; display conservatories include propagation greenhouses, tropical, temperate, and arid plant species

	NPC	LWD	NYBG
Outdoor plant displays/ collections -	100 acre school of horticulture campus, featuring extensive collections of hardy and tropical plants	350 acre Longwood Gardens, featuring extensive collections of hardy and tropical plants	250 acre New York Botanical Garden, featuring extensive collections of hardy and tropical plants
Other special features of note	various landscapes within the 3,000 acre Niagara Parks System, extending along 35 miles of the Niagara Parkway	Longwood Gardens' Continuing Education Program offers 15 - 30 courses per year which gardener trainees may elect to take (in addition to core courses, of which there are 8) free of charge, with permission of the program coordinator *students are required to participate in certain in-service training programs	1,964 acre satelite research institution in Millbrook, New York, The Mary Flaglar Cary Arboretum and Institute of Ecosystem Studies (concentrating on ecological studies). The NYGB Education Department program features over 400 courses per year. Gardener trainees may elect to take courses of interest, which are not required, free of charge at the discretion of the School Director

	NPD	LWD	NYBG
Admission Requirements:			
Application Fee -	$ -0-	$15 non-refundable	$25 non-refundable
Schoolastic Requirements -	* Ontario Secondary School Graduation Diploma or equivalent * official transcript certifying average of 60% each in English, Math, Biology, and Chemistry	* Accredited High School Diploma * official transcript certifying candidate was in upper 50% of graduating class, and English, Math, and Biology. (Chemistry is recommended)	* Accredited High School Diploma * transcript to verify having taken at least one course in Math and one in Science
Horticultural Experience Requirements -	at least two to three summers of practical gardening experience working with a professional	preference given to applicants with one or two years of practical experience in horticulture	six months of paid or voluntary work in horticulture is recommended, and/or an Associate or Bachalaureate Degree in botany or horticulture, or a related field

	NPC	LWD	NYBG
Letter(s) of Recommendation -	two, with preference from employers familiar with the applicants horticultural experience	one reference each (2 total) from previous high school and previous employer	three, with at least one from an individual familiar with applicants work in horticulture
Medical Examination -	none required with the letter of application, but is required of all successful candidates upon acceptance into the program	none formally required, but applicants must sign a form certifying their ability to perform the physical tasks associated with the training program	yes. All applicants must submit a medical examination form with their application materials
Personal Interview -	preferred for applicants residing in the Northeastern portion of Canada. These candidates meet with at least two members of the selection committee usually during July of the year preceding enrollment. All others may be interviewed in person by School Alumni living in areas near to the applicants	yes, fully qualified applicants are invited to attend an interview with members of the selection committee at Longwood Gardens, generally held during November of the year preceding enrollment	yes, applicants residing in the Northeastern US are expected to have a personal interview. All others may be interviewed over the telephone by School staff

	NPC	LWD	NYBG
Age Requirement -	no formal age restriction	under 30 preferred	18 or older
Citizenship -	* primarily Canadian citizens; planning to accept one foreign student per year beginning in 1988 * must be able to understand, speak, and write English	* American citizens, only, are considered for acceptance * must be able to understand, speak, and write English	* applicants from countries outside the United States will be given consideration providing they meet all other requirements * applicants may be required to furnish results of the Test of English as a Foreign Language (TOEFL), and must submit a standard application form in combination with a certified English translation
Filing Deadline for Applications	June 30th of the year preceding desired date of enrollment	September 30th of the year preceding desired date of enrollment	March 1st of the year in enrollment is desired
Financial Assistance -	eligible Canadian applicants may apply to federal and provincial assistance programs	none available	assistance finding part-time work in the area is provided

	NPC	LWD	NYBG
Other Application Conditions or Requirements -	applicants holding horticultural degrees are discouraged from applying. Degrees in non-horticultural, allied fields are acceptable	applicants holding horticultural degrees are discouraged from applying. Degrees in non-horticultural, allied fields are acceptable	applicants must submit a photostatic copy of their birth certificate or other proof of age and nationality
Graduation Requirements:	all students must receive grades of 60% (out of 100%) in all academic subjects and all practical work experiences to receive the Niagara Parks Diploma	all students must maintain a cumulative grade point average of 2.2 (out of 4.0) in both their academic and practical work to receive the Longwood Gardens Diploma in Horticulture	all students must maintain a cumulative grade point average of 2.0 (out of 4.0) in both their academic and practical work to receive the New York Botanical Garden Diploma in Horticulture
Awards:	(CAN funds): * General Proficiency Award ($250) * Landscape Art Award ($250) * Botany Award ($250) * William Holmes Memorial Award (Reference Text) * C.H. Henning Award ($ 50) * The George Hamilton Scholarship* Director's Award (plaque)	* Lois Woodward Paul Memorial Award, presented to alumni having at least two years of experience in horticulture following graduation (Reference	* The Arlo Burdett Stout Award for Academic Achievement (Books) * The Award for Achievement in Developing Horticultural Skills (Books)

NPC	LWD	NYBG
($600) * The James N. Allan Award ($250) * The Western Ontario Gulf Superintendents Award ($250) Awards presented to Undergraduates: First Year Awards Theoretical Horticulture: * The Leonard G. Riley Memorial Scholarship ($100) Practical Horticulture: * The Leonard G. Riley Memorial Scholarship ($150) *Frank N. Schier Award ($200) Second Year Awards General Proficiency: * The Leonard G. Riley Memorial Scholarship ($200) Plant Identification (combination of 1st and 2nd year scores) * The Milne House Garden Club Scholarship ($450) Turfgrass Awards for academic and practical efficiency (2 at $250 ea.)	Text) * Alumni Association Award (plaque)	

Alumni Association:	NPC	LWD	NYBG
Fees -	new students pay $120 (CAN) to become members of the Student Association and help to defray the cost of graduation at the end of their third year. Membership dues in the Association after graduation are $45 (CAN) per year	$10 per year	no membership dues are required at this time
Activities/ Services of Alumni Associations -	* administer a Foundation Fund for annual awards and scholarships * sponsor annual convention for all alumni of the School of Horticulture in Niagara Falls, Ontario * publish a membership listing of alumni, the Blue Book, listing names, addresses, employment data, and telephone numbers. * publish a membership newsletter, the Horticultural Herald * provide job listing information to students and graduates	* sponsor a Dinner Dance every-other odd numbered year * sponsor an annual alumni reunion (picnic) during July * sponsor annual educational meeting at LWD in January * maintain a job placement service for students and record of graduate activity * periodically speak to students on career plans * assist with graduation ceremonies in even-numbered years * members are provided	*alumni lecture to students periodically on career possibilities in horticulture * members recieve a 20% discount on educational courses and symposia offered by the NYGB Education Department * assist in arranging field trips * provide students with internship possibilities * participate in graduation ceremonies * sponsor annual alumni reunion in NYBG conservatory

	NPC	LWD	NYBG
		with a lifetime pass to Longwood Gardens	
II. Course Requirements			
Organization of Classroom/Field Experience:			
ACEDEMIC			
Total # In-Class Hours -	a minimum of 1379 hours from forty-six required academic courses	a minumum of 1008 hours from thirty-three required academic courses	a minimum of 452 hours from forty-two required academic courses
Required Oral Presentations -	First Year no oral presentation Second Year one 30 min. oral presentation on approved horticultural topic Third Year two 30 min. oral presentations, or one 60 min. presentation on approved horticultural topics	First Year one 30 min. oral presentation on approved horticultural topic Second Year two 30 min. oral presentations on approved horticultural topics	no specifically required oral presentations
Required Seminars/Symposia	yes, periodic seminars, not limited to horticultural	yes, but only state-mandated programs, such as in-house	yes,students are required to attend at least twelve seminars

	NPC	LWD	NYBG
	topics, are held for the benefit of the students	right-to-know pesticide seminars	offered at the New York Botanical Garden during their time in the program. Among these are The Barbara Cushing Paley Horticultural Seminars, arranged specifically for the students. Symposia on various horticultural and botanical topics may be attended by students of the School with permission of the Education Department
Grading Criteria: (assigned papers, projects, laboratory work, quizzes, examinations)	evaluation of student work is based upon grades which are assigned by individual instructors for each course offering. Grades are established as policy at the beginning of each course based upon a numerical grading system, on a scale of 0 to 100%. A passing grade in any subject is 60%, with any grade below 60% considered to be failing	evaluation of student work is based upon grades which are assigned by individual instructors for each course offering. Grades are established as policy at the beginning of each course based upon both a numerical and a letter grade system, as follows:	evaluation of student work is based upon grades which are assigned by individual instructors for each course offering. Grades are established as policy at the beginning of each course, and are based upon the following letter grades: Grade Pt.Val. A 4.0 Excellent B+ 3.5

NPC	LWD	NYBG
	% Pt. Val. Grade	Above Ave.
	90-100=4.0 = A	B 3.0
	80-89 =3.0 = B	Good
	70-79 =2.0 = C	C+ 2.5
	60-69 =1.0 = D	Satisfactory
	below 60 = F	C 2.0
	F = Failure	Fair
		D+ 1.5
		Below Ave.
		D 1.0
		Poor (may be req'd to re-take the course)
		F = Failure
		P = Pass
		INC = Incom-plete
		ATT = Attended
		W = Withdrawn
		WU = Withdrawn unofficially

	NPC	LWD	NYBG
Instructor Qualifications:	* most instruction of students is done by School of Horticulture staff. Additional instruction is provided by professionals from area colleges and universities, and professionals from local businesses and trades. * most School of Horticulture staff are holders of a Niagara Parks Diploma. Some possess advanced college degrees in horticulture, or closely allied fields. * visiting instructors that lecture at the School have either highly technical backgrounds, or academic degrees in the subjects they are presenting.	* instruction of students is done by staff of Longwood Gardens. Additional instruction is provided by professionals, and area college and university staff. * Longwood staff, visiting horticulturists, and local teaching professionals generally hold either a Diploma in Horticulture from Longwood, or an advanced degree in horticulture or a closely allied field, or have strong technical training backgrounds.	* instruction of students is done by staff of The New York Botanical Garden, visiting horticultural professionals, and teaching professionals from area colleges and universities. * NYBG staff, visiting horticulturists, and local teaching professionals generally hold either a Diploma in Horticulture from NYBG, or an advanced degree in horticulture or a closely allied field, or have strong technical training backgrounds
Instructor Ratios:	70% staff 30% outside professionals	66% staff 33% outside professionals	33% staff 66% outside professionals

	NPC	LWD	NYBG
Accreditation/ Cooperative Programs:	no formal cooperative agreements with any North American colleges. Any credit given for courses taken at the Niagara Parks Commission School of Horticulture is totally up to each individual college	no formal cooperative agreements have been made with any North American colleges. Any credit given for courses taken at Longwood is totally up to each individual college	The New York Botanical Garden School of Horticulture is licensed by the New York State Department of Education. The School is seeking permision to offer students an Associate in Occupational Studies (A.O.S.) degree in Ornamental Horticulture. Granting of permission will replace the present Diploma in Horticulture. * parallel programs to the Diploma in Hort. program include join agreements with both Bronx Community College and Lehman College of the City University of New York. An Associate's Degree program in Ornamental Horticulture allows students to spend their first year at Bronx Community College, and the second year at the New York Botanical

	NPC	LWD	NYBG
			Garden. A Baccalaureate Degree in Individualized Plant Studies is also available from Lehman College, involving both field and course work at the NYBG
FIELD STUDY WORK:			
Total # Field Study Hours -	4192 hours, including 10-week practicum with the Niagara Parks Commission during the third year	2240 hours, including "student project" days	1500 hours
Work Journal Required:	Yes.	Yes.	Yes.

	NPC	LWD	NYBG
Workshops/Demonstrations -	Yes. Third year students are required to give two or three demonstrations of some practical horticultural technique to fellow students, and interested public that may be visiting the School of Horticulture	orientation excercises early in the program, only (i.e. Cushman motorized cart operation) * various demonstrations and specialized topics by popular demand (i.e., photography, computers, bonsai)	periodic workshops are held to demonstrate various horticultural operations to students. Featured topics might include pruning, irrigation systems maintenance, or machinery operation
Practicums -	students must complete a minimum of 4,192 hours of practical field work. A normal work week of 40 hours is maintained, 8:00 a.m. to 4:30 p.m. Monday through Friday. All students may expect occasional weekend or after-hours duty on a rotational basis	students must complete a minimum of 2,240 hours of prac-tical field work. A work week of 35 hours is maintained, 8:00 a.m. to 4:00 p.m. Monday through Friday. Seasonal time demands may necessitate earlier starting and finishing times throughout the year, and all students must participate in occasional weekend visitor information duty in the main conserv-	students must complete a minimum of 1,500 hours of practical field work. A work week of 35 hours is maintained, 8:00 a.m. to 4:00 p.m. Monday through Friday

	NPC	LWD	NYBG
		atory. Occasional weekend work duty on the grounds of Longwood Gardens	
Description of Field Work -	practical horticultural development and maintenance work is performed by all students on the 100 acre campus/ arboretum which houses the School of Horticulture. All third year students spend a ten week rotational period during the summer months away from the School, assuming apprentice gardening positions with the horticultural work crews of the Niagara Parks Commission. As part of this rotation, some third year students remain on the School campus to provide leadership to first and second year students in developing and maintaining the campus plantings	all students are scheduled to rotate through each of six major areas of Longwood Gardens that comprise the Horticulture Department. Trainees also organize and implement all maintenance to grounds contiguous with their student dormitories. Except for the maintenance of the student dormitory grounds, which is continuous, all students will spend from one to three months working in each of the six major areas of LWD, both outdoors and in the conservatory/ greenhouse complex	all students are scheduled to rotate through various outdoor and indoor sections of the New York Botanical Garden to gain exposure to and competance with a wide range of horticultural areas. Practical experience is gained from work in the Horticulture Department. Work includes rotating through the arboretum, special gardens, collections, the Enid A. Haupt Conservatory, lawn crew, plant records office, and the nursery/propagation range

	NPC	LWD	NYBG
Weekly Practicum/ Classroom Ratio (approximate)	24% Academic 76% Practical	30% Academic 70% Practical	50% Academic 50% Practical
	year is divided into two primary segments: Sept.-March; mostly academic in-class instruction and March-Sept.; mostly practical hands-on work experiences. Throughout the program, part-day periods containing both academic and practical work may be expected to accomodate scheduling and grounds maintenance requirements	organization of practical and in-class time is blocked for students according to a three days practical, two days classroom mix. Scheduling considerations are sometimes reflected in part-day classroom, part-day field work assignments (i.e., 1/2 day "student project" days)	first year students spend approximately three days in the classroom and two days in the Garden. Second year students reverse the schedule by working in the Garden three days, and attending classes two days per week.

	NPC	LWD	NYBG
Internships -	no internships to other institutions are available for students	no internships to other institutions are available for students	students have the option of spending a three month internship during July, August and September at another horticultural institution. Some required coursework may have to be made up.
Field Trips -	all students are required to participate in scheduled field trips according to the following schedule: first year * a one-day regional trip to an area botanical garden, arboretum, or commercial greenhouse or nursery second year * three one-day non-regional trips to botanical gardens, arboreta, or commercial greenhouses and nurseries third year * a two-week trip in North America	all students are required to attend occasional field trips unless an approved absence has been pre-arranged. In addition, there are a number of voluntary field trips and "plant walks" led by various Longwood staff to nearby private gardens that students may attend. During the summer of the second year, students usually participate in a several-day-	all full-time students are required to attend at least sixteen scheduled field trips to various botanical gardens, arboreta, commercial greenhouses and nurseries, and other areas of significant biological or ecological interest

	NPC	LWD	NYBG
	or abroad, to visit horticulturally significant institutions	long regional field trip to horticulturally significant institutions	
Grading of Practical Field Work -	all practical work is graded in accordance to the grading of academic subjects, using numerical %'s. Grades are assigned by NPC personnel, or School staff, with imput from student foremen that may be in charge of the School grounds over a particular period of time	monthly evaluation of students is done by various garden section heads and foremen at Longwood on work performance sheets. Students are rated on numerous work qualities. Supervising foremen provide written critiques for each student	all practical work is assigned a rating which translates into a letter grade, and is based upon student performance in all areas of the Garden. Grades are assigned by NYBG personnel from those areas

III. Post-Graduation Employment

	NPC	LWD	NYBG
Placement Service:	no formal arrangements in providing student employment councel are made through the Niagara Parks Commission School of Horticulture office, but all employment opportunies which are conveyed to the School or its Coordinator are posted on a commonly accessible bulletin board Help is also given to students making plans to graduate by the School of Horticulture Alumni Association.	no formal arrangements in providing student employment councel are made through the Longwood Gardens Professional Gardener Training Program office, but all employment opportunies which are conveyed to the School or its Coordinator are posted on a commonly accessible bulletin board. Help is also given to students by the School Alumni Association.	no formal arrangements in providing student employment are made through the New York Botanical Garden School of Horticulture office, but some individual student council is provided, including resume assistance. Employment opportunies which are conveyed to the School or its Director are posted on a commonly accessible bulletin board
Total # of Program Graduates:	376 (since 1932)	100 (since 1969)	200 (since 1967)
% Still in Horticulture: (if known)	90%	84%	95%

TABLES

A-1 through A-18

Table A-1. Number of full-time employees. (as reported by administrators of public institutions)

Total Employees (#)	N	Institutions (%)
501 - 1000+	2	3.4
201 - 500	6	10.2
101 - 200	5	8.5
76 - 100	5	8.5
26 - 75	22	37.3
11 - 25	14	23.7
0 - 10	5	8.5
Total N	59	

Table A-2. Number of full-time gardeners. (as reported by administrators of public institutions)

Total Gardeners (#)	N	Institutions (%)
50+	2	3.4
25 - 49	7	11.9
15 - 24	8	13.6
5 - 14	28	47.5
0 - 4	14	23.7
Total N	59	

Table A-3. Annual operating budget. (in thousands of U.S. dollars as reported by administrators of public institutions)

Budget ($)	N	Institutions (%)
less than 200,000	2	3.4
200,001 - 500,000	5	8.5
500,001 - 700,000	4	6.8
700,001 - 1,000,000	8	13.6
more than 1,000,000	38	64.4
Total N	57	

Table A-4. Policy for hiring gardeners, or, current level of training and experience. (as reported by administrators and gardeners of public institutions)

Training and Experience	Administrator (%)		Gardener (%)	
Associates Degree	32.2	(59)	20.0	(55)
Bachelors Degree	23.7	(59)	34.5	(55)
Certificate/Diploma	30.5	(58)	30.9	(55)
No Formal Training	28.8	(59)	18.2	(55)
Other	*61.0	(59)	*61.8	(55)

Note: Figures in ( ) are base N's for the adjacent percentages. (Total N = 59 Administrators, 55 Gardeners)

* See Table A-5.

Table A-5. "Other" levels of training or experience required, or, "other" levels of training or experience that you possess. (as reported by administrators and gardeners of public institutions)

Code #	N	Admin. (%)	N	Gard. (%)
1	4	6.8	2	3.6
2	6	10.2	4	7.3
3	3	5.1	3	5.5
4	1	1.7	7	12.7
5	-	-	2	3.6
6	-	-	1	1.8
7	2	3.4	-	-
8	3	5.1	1	1.8
9	40	67.8	35	63.6
Total N	59		55	

Note: Key to codes:

1 = 1-2 years on-the-job experience
2 = unspecified length of on-the-job experience
3 = combined education and related hort. job exp.
4 = 3 or more years on-the-job experience
5 = attended seminars, lectures, conferences or self study
6 = attained advanced degree (i.e., MS)
7 = hiring regulated by Federal or State guidelines
8 = no set policy for hiring
9 = no response

Table A-6. Percentages of administrators, supervisors, and gardeners that believe gardener qualifications have significantly changed over the last decade. (as reported by administrators, supervisors, and gardeners of public institutions)

	(%)	N	Total N
Administrator	54.2	32	52
Supervisor	69.1	38	54
Gardener	65.5	36	50

Table A-7. Ways gardener qualifications have changed in the past decade. (as reported by administrators, supervisors, and gardeners of public institutions)

Code #	N	Admin. (%)	N	Super. (%)	N	Gard. (%)
1	5	8.5	7	12.7	8	14.5
2	11	18.6	12	21.8	10	18.2
3	5	8.5	6	10.9	4	7.3
4	3	5.1	2	3.6	3	5.5
5	4	6.8	-	-	4	7.3
6	3	5.1	2	3.6	1	1.8
7	-	-	6	10.9	5	9.1
8	1	1.7	1	1.8	-	-
9	27	45.8	19	34.5	20	36.4
Total N	59		55		55	

Note: Key to codes:

1 = increased hiring of more highly trained gardeners do to a better educated and more discerning garden management and public garden visitor; more stringent environmental regulations
2 = requirements for more advanced technical and academic training to supplement practical on-the-job experience
3 = requirement for knowledge of horticulturally associated skills, such as the ability to supervise and communicate horticultural knowledge to fellow staff members, volunteers and interns on a continuous, daily basis; hold workshops and lecture; write horticultural articles
4 = increasing requirements for practical, on-the job experience
5 = an increased emphasis on hiring candidates with professional gardening credentials, (i.e., certificate/diploma) due to the larger pool of highly trained and skilled gardeners today

6 = overall lowering of standards; less training as professional gardeners than in the past
7 = an overall upgrading in status for the gardener, from common laborer to skilled professional; more independent responsibility with less supervision
8 = do not know; unable to say
9 = no response

Table A-8. Gardener work assignments. (as reported by administrators and supervisors of public institutions)

Assignment	Administrator (%)		Gardener (%)	
specific area	79.7	(59)	61.8	(55)
specific job	25.4	(59)	21.8	(55)
where needed	40.7	(59)	27.3	(55)

Note: Figures in ( ) are base N's of the adjacent percentages. (Total N = 59 Administrators, 55 Gardeners)

Table A-9. Level of horticultural expertise entry-level gardeners brought to their institutions. (as reported by administrators and supervisors of public institutions)

Expertise	Administrator (%)		Supervisor (%)	
no hort. skills	18.6	(59)	7.3	(55)
most hort. skills	88.1	(59)	85.5	(55)
specilized hort. skills	18.6	(59)	10.9	(55)

Note: Figures in ( ) are base N's for the adjacent percentages. (Total N = 59 Administrators, 55 Supervisors)

Table A-10. Degree of skill importance for gardeners. (as reported by administrators, supervisors, and gardeners of public institutions)

Skill	Critical (%)			Desirable (%)			Not Important (%)		
	A	S	G	A	S	G	A	S	G
a)	23.7 (59)	32.7 (55)	69.1 (55)	69.5 (59)	54.5 (55)	29.1 (55)	6.8 (59)	12.7 (55)	1.8 (55)
b)	32.2 (59)	34.5 (55)	72.7 (55)	62.7 (59)	54.5 (55)	27.3 (55)	5.1 (59)	10.9 (55)	-- (55)
c)	11.9 (58)	10.9 (55)	21.8 (55)	32.2 (58)	50.9 (55)	58.2 (55)	54.2 (58)	38.2 (55)	20.0 (55)
d)	18.6 (56)	21.8 (54)	34.5 (54)	45.8 (56)	50.9 (54)	47.3 (54)	30.5 (56)	25.5 (54)	16.4 (54)
e)	35.6 (58)	40.0 (54)	76.4 (55)	50.8 (58)	49.1 (54)	20.0 (55)	11.9 (58)	9.1 (54)	3.6 (55)
f)	28.8 (59)	36.4 (54)	69.1 (55)	69.5 (59)	60.0 (54)	30.9 (55)	1.7 (59)	1.8 (54)	-- (55)
g)	22.0 (58)	25.5 (55)	47.3 (55)	62.7 (58)	65.5 (55)	49.1 (55)	13.6 (58)	9.1 (55)	3.6 (55)
h)	55.9 (59)	58.2 (55)	76.4 (55)	39.0 (59)	34.5 (55)	23.6 (55)	5.1 (59)	7.3 (55)	-- (55)
i)	49.2 (59)	47.3 (55)	61.8 (55)	47.5 (59)	49.1 (55)	36.4 (55)	3.4 (59)	3.6 (55)	1.8 (55)
j)	27.1 (58)	18.2 (55)	36.4 (55)	55.9 (58)	58.2 (55)	52.7 (55)	15.3 (58)	23.6 (55)	10.9 (55)
k)	47.5 (59)	58.2 (55)	92.7 (55)	47.5 (59)	34.5 (55)	7.3 (55)	5.1 (59)	7.3 (55)	-- (55)

Skill	Critical (%)			Desirable (%)			Not Important (%)		
	A	S	G	A	S	G	A	S	G
l)	13.6 (58)	18.2 (55)	27.3 (54)	47.5 (58)	54.5 (55)	58.2 (54)	37.3 (58)	27.3 (55)	12.7 (54)
m)	30.5 (59)	32.7 (55)	65.5 (55)	44.1 (59)	50.9 (55)	23.6 (55)	25.4 (59)	16.4 (55)	10.9 (55)
n)	5.1 (59)	3.6 (55)	14.5 (55)	25.4 (59)	30.9 (55)	49.1 (55)	69.5 (59)	65.5 (55)	36.4 (55)
o)	5.1 (57)	3.6 (55)	30.9 (55)	37.3 (57)	50.9 (55)	52.7 (55)	54.2 (57)	45.5 (55)	16.4 (55)
p)	15.3 (57)	7.3 (55)	20.0 (55)	30.5 (57)	43.6 (55)	58.2 (55)	50.8 (57)	49.1 (55)	20.0 (55)
q)	5.1 (59)	7.3 (55)	18.2 (55)	10.2 (59)	16.4 (55)	38.2 (55)	84.7 (59)	76.4 (55)	43.6 (55)
r)	13.6 (58)	10.9 (55)	41.8 (55)	30.5 (58)	45.5 (55)	45.5 (55)	54.2 (58)	43.6 (55)	12.7 (55)
s)	28.8 (59)	41.8 (55)	69.1 (55)	55.9 (59)	41.8 (55)	30.9 (55)	15.3 (59)	16.4 (55)	-- (55)
t)	52.2 (59)	60.0 (55)	80.0 (55)	40.7 (59)	32.7 (55)	20.0 (55)	6.8 (59)	7.3 (55)	-- (55)
u)	15.3 (59)	10.9 (55)	38.2 (55)	62.7 (59)	67.3 (55)	56.4 (55)	22.0 (59)	21.8 (55)	5.5 (55)
v)	5.1 (58)	9.1 (55)	32.7 (55)	42.4 (58)	61.8 (55)	52.7 (55)	50.8 (58)	29.1 (55)	14.5 (55)

Note: Figures in ( ) are base N's for the adjacent percentages. (Total N = 59 Administrators, 55 Supervisors, 55 Gardeners)

Key to skills:

A = Administrator
S = Supervisor
G = Gardener

a) = identification, selection and care of annuals and herbaceous perennials
b) = identification, selection and care of trees, shrubs, and vines
c) = identification and care of turfgrass
d) = identification and care of non-hardy plants (i.e., tropical conservatory plants)
e) = selection, handling and use of pesticides
f) = selection, handling and use of fertilizers
g) = selection, handling and use of mulches
h) = handling, use, and general care of hand tools (i.e., rakes, shovels, pruners, etc...)
i) = handling, use, and general care of small power equipment (i.e., chainsaws, rototillers, line trimmers, etc...)
j) = handling, use, and general care of large power equipment (i.e., tractor, dump truck, riding lawn mower, etc...)
k) = proper pruning techniques
l) = propagation of woody and herbaceous plants (asexual and sexual)
m) = soil preparation, amendment, and testing
n) = site mapping, surveying, and drafting
o) = interpretation of landscape drawings
p) = selection, installation, and maintenance of landscape construction materials (i.e., retaining walls, pavings, etc...)
q) = preparation of budgets and forecasting of costs
r) = project management and supervision
s) = effective communication (oral and written) with colleagues and the public
t) = management of time
u) = familiarity with botanical and horticultural literature (i.e., magazines and journals)
v) = use of plant keys

Table A-11. Anticipated gardener positions to fill within next five years. (as reported by administrators of public institutions)

Positions	N	Institutions (%)
0	3	5.1
1 - 5	43	72.9
6 - 9	9	15.3
10 - 19	1	1.7
20 or more	2	3.4
Total N	58	

Table A-12. Percentage of institutions that provide in-service training for employees. (as reported by administrators and supervisors of public institutions)

	(%)	N	Total N
Administrator	62.7	37	59
Supervisor	54.5	30	55

Table A-13. Description of current in-service training programs. (as reported by administrators and supervisors of public institutions)

Code #	N	Administrator (%)	N	Supervisor (%)
1	9	15.3	5	9.1
2	14	23.7	6	10.9
3	5	8.5	6	10.9
4	8	13.6	11	20.0
5	1	1.7	2	3.6
6	--	--	1	1.8
9	22	37.3	24	43.6
Total N	59		55	

Note: Key to codes:

1 = formal in-class or seminar format training, may have examinations, generally on horticulturally related topics. Instructors may be in-house, or from outside institutions
2 = majority of "in-service" training is done on-the-job; teaching is done by a more experienced or senior staff member
3 = staff encouraged to take compensated courses, or to attend horticultural meetings, related to areas of job responsibility, at affiliated or outside institutions, academic or otherwise
4 = non-formal, periodic training in-class or on-site, (i.e., demonstrations, seminars, workshops); instructors are generally in-house, may be from outside institutions
5 = both 3 and 4
6 = both 1 and 3
9 = no response

Table A-14. Provisions for future in-service training programs in the next five years. (as reported by administrators and supervisors of public institutions)

	(%)	N	Total N
Administrator	48.0	12	25
Supervisor	25.0	6	24

Table A-15. Description of future in-service training programs. (as reported by administrators and supervisors of public institutions)

Code #	N	Administrator (%)	N	Supervisor (%)
1	5	8.5	2	3.6
2	1	1.7	--	--
3	--	--	--	--
4	6	10.2	3	5.5
5	1	1.7	--	--
6	--	--	1	1.8
9	46	78.0	49	89.1
Total N	59		55	

Note: Key to codes:

1 = plans to initiate formal in-class or seminar format training on horticultural or related topics; instructors may be in-house or from outside institutions
2 = plans to increase on-the-job training; teaching to be done by more experienced or senior staff members
3 = plans to encourage staff to take compensated courses or to attend horticultural meetings, related to areas of job responsibility, at affiliated or outside institutions, academic or otherwise
4 = plans to increase non-formal, periodic training in-class or on-site, (i.e., demonstrations, seminars, workshops); instructors likely to be in-house, may be from outside institutions
5 = both 3 and 4
6 = both 2 and 4
9 = no response

Table A-16. Ranking of skills important for "Supervisors". (as reported by administrators, supervisors, and gardeners of public institutions)

Skill	Most Important (ranked 1 - 2)			Important (ranked 3 - 5)			Least Important (ranked 6 - 7)		
	A	S	G	A	S	G	A	S	G
		(%)			(%)			(%)	
a)	75.4 (59)	58.9 (55)	56.8 (55)	12.3 (59)	13.7 (55)	25.4 (55)	-- (59)	5.9 (55)	11.8 (55)
b)	31.6 (59)	29.4 (55)	19.6 (55)	47.4 (59)	43.1 (55)	58.9 (55)	8.8 (59)	5.9 (55)	15.7 (55)
c)	26.1 (59)	27.5 (55)	47.0 (55)	50.9 (59)	33.3 (55)	33.3 (55)	10.6 (59)	17.6 (55)	13.7 (55)
d)	3.5 (59)	2.0 (55)	13.7 (55)	50.9 (59)	56.9 (55)	58.8 (55)	33.4 (59)	19.6 (55)	21.5 (55)
e)	31.6 (59)	29.4 (55)	39.2 (55)	50.8 (59)	41.1 (55)	51.0 (55)	5.3 (59)	7.8 (55)	3.9 (55)
f)	7.1 (59)	7.8 (55)	4.0 (55)	38.7 (59)	35.3 (55)	37.3 (55)	42.1 (59)	35.3 (55)	52.9 (55)
g)	1.8 (59)	2.0 (55)	7.9 (55)	10.7 (59)	11.8 (55)	19.7 (55)	75.0 (59)	64.7 (55)	66.7 (55)

Note: Figures in ( ) are base N's for the adjacent percentages. (Total N = 59 Administrators, 55 Supervisors, 55 Gardeners)

Key to skills:

A = Administrators
S = Supervisors
G = Gardeners

a) = ability to supervise and motivate others
b) = ability to effectively manage time
c) = ability to communicate effectively with colleagues and the public
d) = ability to predict project needs
e) = ability to organize and implement projects
f) = ability to manage conflicts
g) = ability to manage finances

Table A-17. Top three supervisory skills of importance for "Gardeners". (as reported by administrators, supervisors, and gardeners of public institutions)

Skill	Most Important			Second Most Important			Third Most Important		
	A	S (%)	G	A	S (%)	G	A	S (%)	G
a)	13.8 (58)	17.3 (52)	17.0 (53)	6.9 (58)	4.0 (50)	15.4 (52)	9.3 (54)	12.0 (50)	9.6 (52)
b)	48.3 (58)	40.4 (52)	34.0 (53)	29.3 (58)	36.0 (50)	23.1 (52)	11.1 (54)	8.0 (50)	15.4 (52)
c)	8.6 (58)	13.5 (52)	11.3 (53)	29.3 (58)	22.0 (50)	28.8 (52)	25.9 (54)	30.0 (50)	23.1 (52)
d)	3.4 (58)	-- (52)	11.3 (53)	12.1 (58)	18.0 (50)	7.7 (52)	13.0 (54)	18.0 (50)	23.1 (52)
e)	24.1 (58)	26.9 (52)	24.5 (53)	19.0 (58)	18.0 (50)	21.2 (52)	24.1 (54)	24.0 (50)	25.0 (52)
f)	-- (58)	1.9 (52)	-- (53)	1.7 (58)	2.0 (50)	1.9 (52)	13.0 (54)	6.0 (50)	1.9 (52)
g)	-- (58)	-- (52)	-- (53)	-- (58)	-- (50)	-- (52)	1.9 (54)	2.0 (50)	-- (52)
h)	1.7 (58)	-- (52)	1.9 (53)	1.7 (58)	-- (50)	1.9 (52)	1.9 (54)	-- (50)	1.9 (52)
Total N	(58)	(52)	(53)	(58)	(50)	(52)	(54)	(50)	(52)

Note: Key to skills:

A = Administrators
S = Supervisors
G = Gardeners

a) = ability to supervise and motivate others
b) = ability to effectively manage time
c) = ability to communicate effectively with colleagues and the public
d) = ability to predict project needs
e) = ablility to organize and implement projects
f) = ability to manage conflicts
g) = ability to manage finances
h) = all skills (a-g) are important

Table A-18. Additional issues concerning gardener qualifications and training. (as reported by administrators, supervisors, and gardeners of public institutions)

Code #	N	Admin. (%)	N	Super. (%)	N	Gard. (%)
1	3	5.1	9	16.4	12	21.8
2	7	11.9	3	5.5	1	1.8
3	4	6.8	4	7.3	2	3.6
4	3	5.1	1	1.8	--	--
5	4	6.8	1	1.8	6	10.9
6	4	6.8	1	1.8	5	9.1
7	--	--	--	--	1	1.8
8	1	1.7	--	--	2	3.6
9	26	44.1	29	52.7	23	41.8
0	7	11.9	7	12.7	3	5.5
Total N	59		55		55	

Note: Key to codes:

1 = gardeners, in general, require more practical hands-on horticultural skills and training to supplement any formal horticultural education they may possess; more need for professional gardener training programs in North America
2 = while aware of the need to hire better qualified gardeners, or to provide staff gardeners with better in-service training, are frustrated by tight budgets, federal or state hiring requirements, or the unskilled labor force from which to choose gardeners
3 = increased awareness, or reaffirmed commitment to future in-service or on-the-job training programs; confirmed belief in the need for more qualified professional gardeners in our (and in other) public institutions; increased support for seminars, off-site educational programs for staff
4 = survey is inappropriate to our situation

5 = more need for gardeners to possess skills or traits in the following areas: interpersonal communications, basic computer skills, pesticide handling and application procedures, knowledge of safety issues, basic management techniques, time management skills, "team" interaction skills, public relations skills, dedication, initiative, and job pride
6 = miscellaneous remarks
7 = frustrated by the low status and wages assigned to "gardeners"
8 = both 1 and 5
9 = no response
0 = no; no comment

SOURCES CONSULTED

Abella, Kay Tytler. Building Successful Training Programs. Reading, Massachusetts: Addison-Wesley Publishing Co., Inc., 1986.

The American Horticulture Society. North American Horticulture: A Reference Guide. New York: Charles Scribner's sons, 1982.

Apps, Darrel A. "Professional Gardener Training Program Review Committee Oral Report." Final report to the Professional Gardener Training Program Executive Committee. Kennett Square, Pennsylvania: Longwood Gardens, Inc., Education Division, 31 March 1986.

Armstrong, George, Principal Scientific Officer of The Royal Botanic Garden. Interview with author, 1 June 1987, Edinburgh. Transcribed notes. The Royal Botanic Garden, Edinburgh, Scotland, U.K.

The Arnold Arboretum of Harvard University. "Hardiness Zones of the United States and Canada." In Wyman's Gardening Encyclopedia, Donald Wyman, front cover jacket. New York: Macmillan Publishing Co., Inc.,1974.

Cornwell, J. B. "Measure Trainees Against Objective Before You Train Them." In Designing and Delivering Cost - Effective Training - and Measuring the Results, eds. Philip Jones, Linda Standke, and Ron Zemke. Minneapolis, Minnesota: Lakewood Publications, 1983; Second printing, 81-82.

Craig, Robert L. Training and Development Handbook, 2d ed. New York: McGraw-Hill, 1976.

Cram, David D. "How to Design the Ideal Training Course." In Designing and Delivering Cost - Effective Training - and Measuring the Results, eds. Philip Jones, Linda Standke, and Ron Zemke. Minneapolis, Minnesota: Lakewood Publications, 1983; Second printing, 179-182.

Dillman, Donald A. Mail and Telephone Surveys: The Total Design Method. New York: John Wiley & Sons, 1978.

Driscoll, Karen, and Ernie Wasson. "Professional Gardener's Employer Questionnaire." Kennett Square, Pennsylvania: Longwood Gardens, Inc., Education Department. 1982.

Fernsworth, Jeannie, Coordinator of Student Services. Interview with author, 30 July 1987, Bronx. Transcribed notes. The New York Botanical Garden, Bronx, New York.

Foresman, David J., Coordinator of Resident Student Programs, Longwood Gardens, Inc. Interview by author, 5 February 1988, Kennett Square. Transcribed notes. Longwood Gardens, Inc., Kennett Square, Pennsylvania.

Frowine, Steven A. "An Educators Guide to Programs, Services, and Facilities of Arboreta and Botanical Gardens of Northeastern United States and Nearby Canada." M.S. diss., Cornell University, 1972.

Goldstein, Irwin L. Training in Organizations: Needs Assessment, Development, and Evaluation, 2d ed. Monterey, California: Brooks/Cole Publishing Company, 1986.

Gress, Karen. "Harvard of Horticulture" The Philadelphia Inquirer. 20 September 1987, 47-CC.

Hodyss, Loretta. "A Curriculum Study for a Professional Gardeners' Training Program." M.S. diss., University of Delaware, 1971.

Kern, Rosemary. "Information about 21-month program and internship program." Catalogue insert. Bronx, New York: The New York Botanical Garden School of Horticulture. Education Department, July 1987.

Ladendorf, Sandra. "Hands-on Experience." In Weeds Trees & Turf. November 1985, 60, 62-63.

Longwood Gardens, Inc. "Application for Longwood Gardens' Professional Gardener Training Program." Kennett Square, Pennsylvania: Longwood Gardens, Inc., Education Division, 1987.

_____. "Horticultural Skills Check List." Program check list for Longwood Gardens' Professional Gardener Training Program. Kennett Square, Pennsylvania: Longwood Gardens, Inc. Education Division, April 1987.

_____. Longwood Gardens' Professional Gardener Training Program Instructors Manual. Kennett Square, Pennsylvania: Longwood Gardens, Inc. Education Division, March 1988.

_____. "Professional Gardener Training Program at Longwood Gardens." Kennett Square, Pennsylvania: Longwood Gardens, Inc., Education Division, August 1987.

_____. "Professional Gardener Training Program Statement of Purpose." Kennett Square, Pennsylvania: Longwood Gardens, Inc., 1987.

Mack, James A. "Alumni Survey Results," Part I. Kennett Square, Pennsylvania: Longwood Gardens, Inc., Education Division. January 1987.

_____. "Alumni Survey Results," Part II. Kennett Square, Pennsylvania: Longwood Gardens, Inc., Education Division. January 1987.

_____. "Longwood Gardens' Professional Gardener Training Program Alumni Survey," Part I. Kennett Square, Pennsylvania: Longwood Gardens, Inc., Education Division. November, 1986.

_____. "Longwood Gardens' Professional Gardener Training Program Employer Survey," Part II. Kennett Square, Pennsylvania: Longwood Gardens, Inc., Education Division. November, 1986.

The New York Botanical Garden School of Horticulture. 1983 - 85 Catalogue. Vol. V. Bronx, New York: The New York Botanical Garden, Education Department, 1983.

_____. NYBG Education Department Fact Sheet, "Certificates, Courses and College-level Programs." Bronx, New York: The New York Botanical Garden. Education Department, November 1986.

_____. Winter 1988 - Catalogue. Bronx, New York: The New York Botanical Garden. Education Division, 1988.

The Niagara Parks Commission School of Horticulture. "History of the School." Prospectus insert. Niagara Falls: The Niagara Parks Commission School of Horticulture, Niagara Falls, Ontario, Canada, June 1983.

_____. The Niagara Parks Commission School of Horticulture Curriculum. Niagara Falls: The Niagara Parks Commission School of Horticulture, Ontario, Canada, 1988.

_____. "School of Horticulture Prospectus 1987." Niagara Falls: The Niagara Parks Commission School of Horticulture, Niagara Falls, Ontario, Canada, 1987.

The Niagara Parks Commission School of Horticulture Alumni Association. "Blue Book - 1985." Niagara Falls: The Niagara Parks Commission School of Horticulture Alumni Association, Niagara Falls, Ontario, Canada, 1985.

Odiorne, George S., and Geary A. Rummler. Training and Development: A Guide for Professionals. Chicago: Commerce Clearing House, Inc., 1988.

Snowden, William, Commissioner of The Niagara Parks Commission School of Horticulture. Interview by me, 6 April 1987, Niagara Falls. Transcribed notes. The Niagara Parks Commission School of Horticulture, Niagara Falls, Ontario, Canada.

_____. to me , 9 February 1988, TDS. The Niagara Parks Commission School of Horticulture, Niagara Falls, Ontario, Canada.

_____. to me , 16 March 1987, TLS. The Niagara Parks Commission School of Horticulture, Niagara Falls, Ontario, Canada.

Randall, Colvin. "Longwood Gardens accepts applicants for 1988 Professional Gardener Training Program." News release. Kennett Square, Pennsylvania: Longwood Gardens, Inc., 8 June 1987.

Spitzer, Dean. "Do's and Don'ts of Questionnaire Design." In Designing and Delivering Cost - Effective Training - and Measuring the Results, eds. Philip Jones, Linda Standke, and Ron Zemke. Minneapolis, Minnesota: Lakewood Publications, 1983; Second printing, 45-46.

Stokes, Paul M. Total Job Training. American Management Association, Inc., 1966.

Thomas, R. William, Minutes of the Longwood Gardens Professional Gardener Training Program Executive Committee Meeting. Kennett Square, Pensylvania: Longwood Gardens Inc., Education Division, 9 November 1987.

Tracey, R. William. Evaluating Training and Development Systems. American Management Association, Inc., 1968.

Zelonis, Mark E. "Grounds Maintenance Time Requirements." M.S. diss., University of Delaware, 1987.

Zemke, Ron and David Walonick. "The Non-statistician's Approach to Surveys." In Designing and Delivering Cost - Effective Training - and Measuring the Results, eds. Philip Jones, Linda Standke, and Ron Zemke. Minneapolis, Minnesota: Lakewood Publications, 1983; Second printing, 47-52.