

NATIVE PLANT HABITAT DISPLAYS

By

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ABSTRACT

A native plant habitat display is defined as a cultivated public display of native plants which attempts to simulate the appearance of a natural plant association. A national mail survey of gardens displaying native plants revealed that habitat displays represent a strong future trend for native plant exhibits in public gardens.

A case study at North Carolina Botanical Garden (NCBG) examined the objectives and methods of a habitat display, the response of visitors, and the factors influencing the display's educational effectiveness. Exit interviews with visitors illuminated how personal background and experience influenced appreciation and learning. Factors strongly influencing visitor response to the display included visit purpose, expectations of NCBG, possession of knowledge relating to the plant habitats depicted, and wayfinding ability.

Other techniques examined the influence of display elements on visitor response. To assess the role of visual features, Visitor-employed Photography, a technique for measuring perceptions of natural environments, was adapted to the purposes of the study. Visitor subjects were issued an automatic camera and asked to travel a defined route through the display, photographing the features they found most interesting or that "grabbed their attention." Photographic data was correlated with observations of visitor behavior in the display, yielding a map of visitor response. The display features most strongly influencing visitor response to the display were inventoried, revealing that elements bearing novelty or mystery, flower color, and water features all elicited positive visitor response.

Based upon the NCBG study results, recommendations are made for the improved design and interpretation of habitat displays. Recommended interpretation methods include use of conceptual orientation, story labels and plant identification. Design methods include the creation of perceptually exciting nodes and the use of landscape immersion techniques.

CHAPTER 1

NATIVE PLANT HABITAT DISPLAYS

Introduction

A native plant habitat display is defined as a cultivated public display of U.S. native plants which attempts, in some way, to simulate the appearance of a natural plant association. Case study research will examine the educational effectiveness of such exhibits and make recommendations for their improved design and interpretation.

Habitat gardens are perceived by many public garden professionals as possessing great potential for imparting appreciation for plant communities and concern for threatened floras to the general public. As the pace of habitat destruction and species endangerment accelerates, environmental education becomes an increasingly urgent endeavor for many public gardens. In the arena of native flora advocacy, habitat displays capable of communicating a conservation message, as well

as providing aesthetic and recreational experiences, promise much to the visiting public.

Until now, research relating to habitat displays has been concerned primarily with horticultural and botanical concerns rather than interpretive or educational issues. Therefore, in response to a void in the field, this research provides insight into the experience of visitors in habitat gardens; a critical but heretofore unexplored component of the habitat display.

A Historical Perspective

Since well before the time of John Bartram, exploring, describing and cultivating the native flora of the United States has been a major preoccupation for American horticulture and botany (Leighton, 1970). Through the Colonial period and the 1800s, this activity focused on the search for useful and economically valuable plants, most notably lumber, crops, and medicinals. Outside of the small and insular world of early American ornamental horticulture, native vegetation was commonly perceived as part of the New World bounty to be scientifically inventoried and economically exploited. In the late 19th century, public exhibits relating to native plants, such as the Collection of American Woods staged by Charles

Sargent in 1885 (Sutton, 1970), presented the nation's flora as a subject for scientific inquiry and a valuable natural resource. Up until the writings of George Marsh (1870) and other early conservationists, native flora was largely perceived as either valuable timber, vegetation to be cleared for agriculture, or part of the untamed wilderness.

In the later 1800s however, public attitudes toward native flora, and the environment as a whole, began to change. Efforts to preserve natural areas, both public and private, recognized native plants, especially "wildflowers" and majestic trees, as unique natural treasures worthy of special preservation. National parks and city parks preserved large tracts of native vegetation where the general public could appreciate natural beauty and escape oppressive urban environments.

Despite great interest in American native plants abroad, their garden use was not a popular or deliberate focus in early American domestic horticulture. However, several of the country's most prominent early plantsmen were proponents of the garden potential and botanical importance of many native species. The extensive collections and nurseries assembled by Bartram, Marshall, and other botanists were probably among the first purely

native botanic gardens (Leighton, 1987). In 1800, David Hosack founded the Elgin Botanic Garden in New York City and hoped to display "a complete flora of the state." Though Hosack's goal was never realized, interest in the use of natives persisted as Robert Buist (1839), Joseph Breck (1859), F.J. Scott (1870) and other 19th century horticultural authors extolled the beauty and usefulness of many native plants to the gardening public.

By the early 20th century, native plants had become a special interest of small but dedicated groups of amateur and professional horticulturists. Ornamental displays of native plants were mounted by wildflower societies, botanical gardens, and private organizations and individuals. In the 1920s and 1930s, Santa Barbara Botanic Garden (1926), Garden in the Woods (1930) Desert Botanical Gardens (1937), and other public horticulture institutions specializing in native plants were founded. Their native plant displays included both gardenesque formal landscapes as well as more naturalistic "wildflower gardens." Other institutions chose to display native plants in a more ecological context, emphasizing their role in natural communities. Most notably, in the late 1930s, the University of Wisconsin Arboretum began the Greene Prairie, the first public garden "ecological

restoration", assembling natives in a recreation of a natural plant community.

Interest in public displays of native plants grew at a slow but steady level, until the 1960s and 70s, when public interest in the environment and ecology reached new heights. In the past 30 years, many institutions, both old and new, have initiated native plant displays. With an emphasis on regional floras, North Carolina Botanical Garden (1961), Crosby Arboretum (1965), and other gardens stressing the value and beauty of native plants have been founded.

Native Plant Habitat Displays: A Profile

The public display of native plants today occurs in many forms, ranging from gardenesque landscapes to ethnobotanic exhibits. This section describes the characteristics of those gardens which use habitat displays to present specific plant communities and local floras to the public.

To assess current display design and interpretive strategies, public gardens claiming displays devoted exclusively to native plants (Sawyers, 1984; Jacob, 1985) were surveyed by mail (Appendix 1). Of the eighty-six such gardens located, sixty-three display plant

communities or local floras. Approximately 80% of the latter use habitat displays or ecological restorations (a reconstructed plant community, interpreted as a type of habitat display) to represent specific plant communities and floras (i.e., Tallgrass Prairie as opposed to the more generic "wildflower garden"). The following profile is based upon the characteristics of this group.

Before proceeding to describe them, it is important to note that the term habitat display is used in a rather broad sense to describe a range of naturalistic design strategies. Such gardens may be seen as existing along a continuum of increasingly authentic naturalism. At the most gardenesque extreme, members of a plant community are arranged in the landscape according to environmental requirements (sunlight, moisture, etc.) but with little regard as to their actual distribution or density in the natural state. These gardens may be seen as attempting to replicate the visual character of a flora with stylizations rather than botanical accuracy. At the opposite extreme are those gardens which are patterned as closely as possible after natural models. In some cases called ecological restorations (23 of the gardens surveyed claimed ecological restorations), these gardens attempt to recreate the actual species composition, distribution, and

ecological processes of the depicted community. But for the purposes of this study, all habitat gardens along this continuum, regardless of degree of authenticity, share one essential characteristic; they attempt to communicate to the visitor the unique visual qualities of a particular flora.

General Characteristics. A profile of the institutions presenting native plant habitat displays includes their location, age, and other general characteristics.

Though these institutions are found throughout the country, they are most concentrated in the Southwest (54%) and Southeast (35%). In addition, many of the gardens most recently founded are in these regions, perhaps reflecting the vigorous growth of the nation's sunbelt.

Most of the sample gardens have been displaying natives since their inception and are presently developing new native displays for the future. On the average, their display facilities first opened to the public 25 years ago, they first displayed native plants 22 years ago (Figure 1), and initiated their most recent public display of natives roughly 4 years ago. Ninety-four percent of the respondents described their institutions as either a

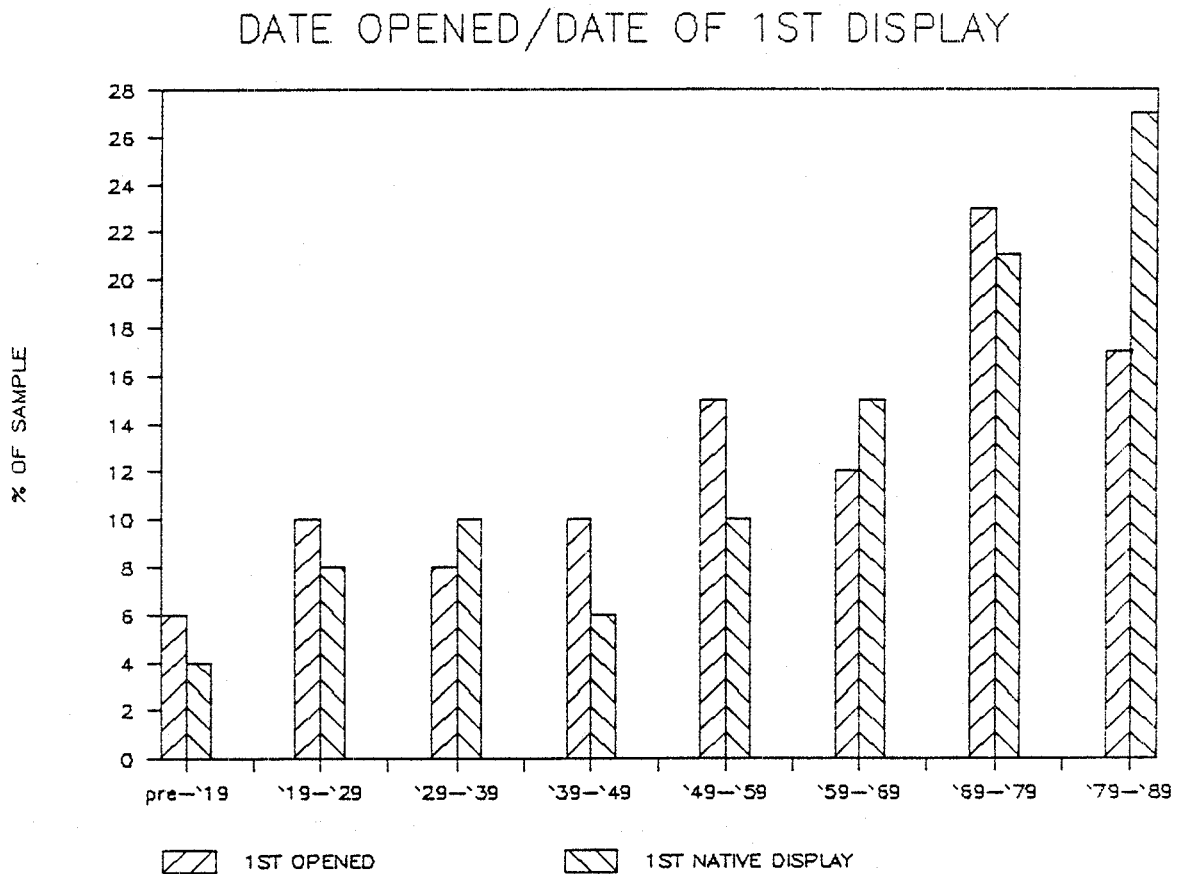


Figure 1 Dates that gardens with native plant habitat displays first opened to the public and first displayed native plants.

botanic garden or arboretum. But 33% also describe themselves as nature centers, 13% as museums, and 12% as parks. Form of governance is also varied, with 50% managed by private foundations, 29% by universities, and 28% publicly owned and managed facilities (several gardens placed themselves in two categories).

Native Plant Displays. Importantly, at most of these institutions, habitat displays are part of a larger institutional focus on native plants. For many, the display of native plants is one of several ongoing native plant programs (Figure 2). Eighty-one percent of the gardens also have educational programs relating to natives, 67% have native plant propagation and plant sales programs, and 52% publish periodicals which include native plant information. In addition, 48% of the gardens have native plant research projects and 40% are involved in ex-situ conservation work.

In most of these gardens, visitors see native plants in both naturally occurring stands and garden plantings. Eighty-eight percent of the gardens sampled possess uncultivated as well as cultivated native plant areas (Figure 3). At these gardens, an average of 25% of their total public area is devoted to cultivated displays, with 33% of the area bearing uncultivated vegetation. The

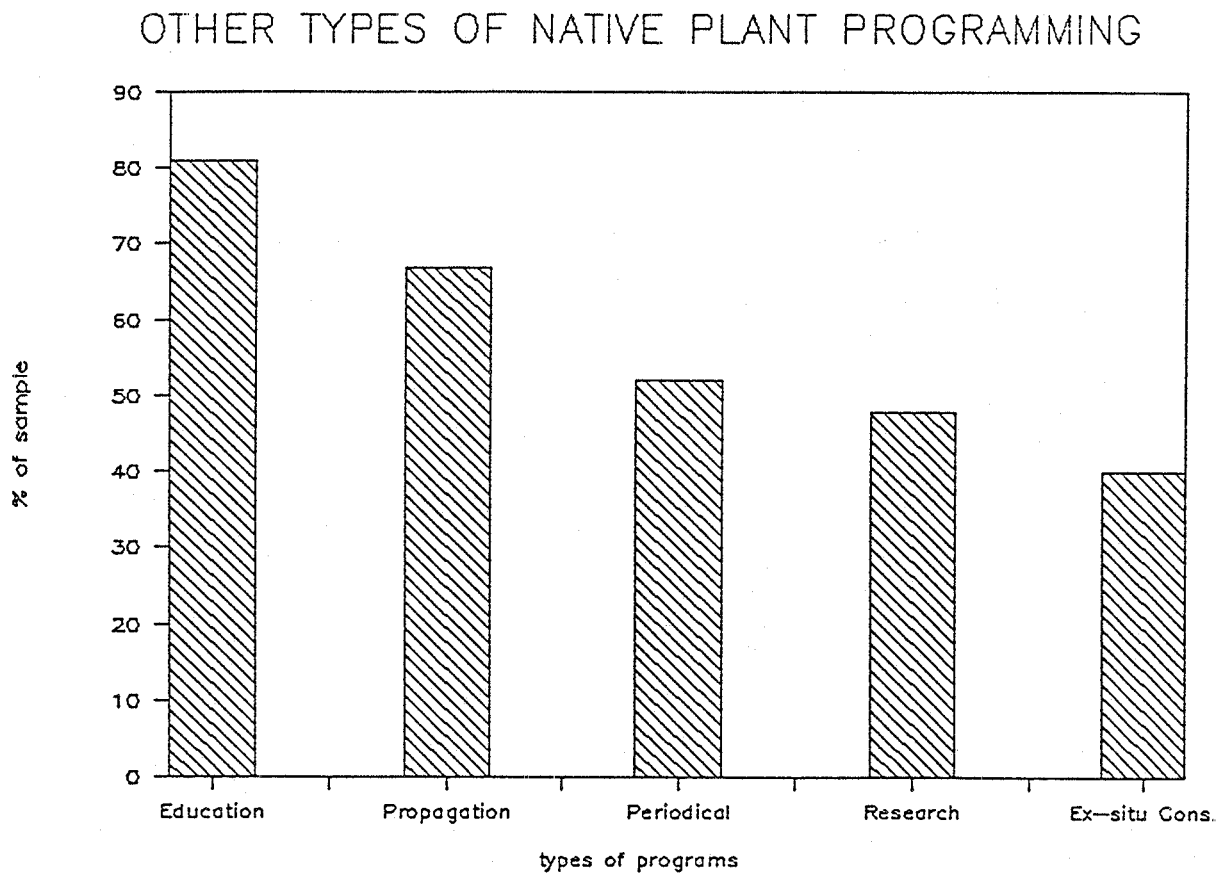


Figure 2 Other types of native plant programs and activities conducted at survey gardens

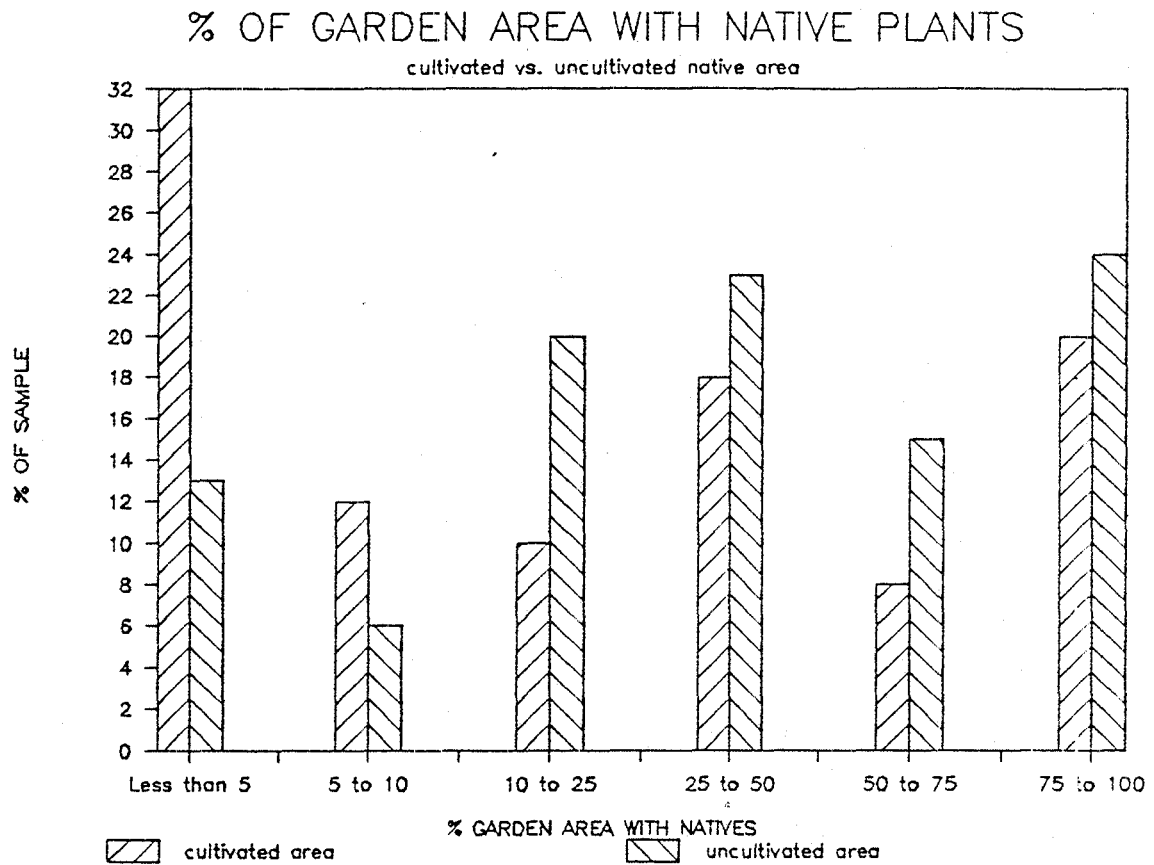


Figure 3 Percentage of total public garden area at survey gardens bearing cultivated or uncultivated native plants

average amount of garden area cultivated with native plants is roughly 18 acres. (Note: the term cultivation is defined as any deliberate planting of natives).

In addition to habitat displays depicting plant communities, 67% of the gardens use display types which emphasize other kinds of native plant information (Figure 4). Seventy-five percent of the gardens display natives in landscape plantings emphasizing the value of natives as garden plants. Fifty-four percent use collection displays of native plants from specific geographic regions or particular taxonomic groups. Finally, ethnobotanic displays focusing on Native American plant use are found at 13% of the institutions. Notably, 54% of the gardens utilize three or more of these design strategies in displaying natives to the public.

Gardens use a wide range of terminology in describing the contents of their native plant displays to the visiting public. As in other forms of taxonomy, the process of naming and describing native displays utilizes both lumping and splitting approaches. Many describe their habitat displays in terms of their dominant or limiting environmental factor, such as Acid Bog or Limestone Barren. Others use broader, more generally

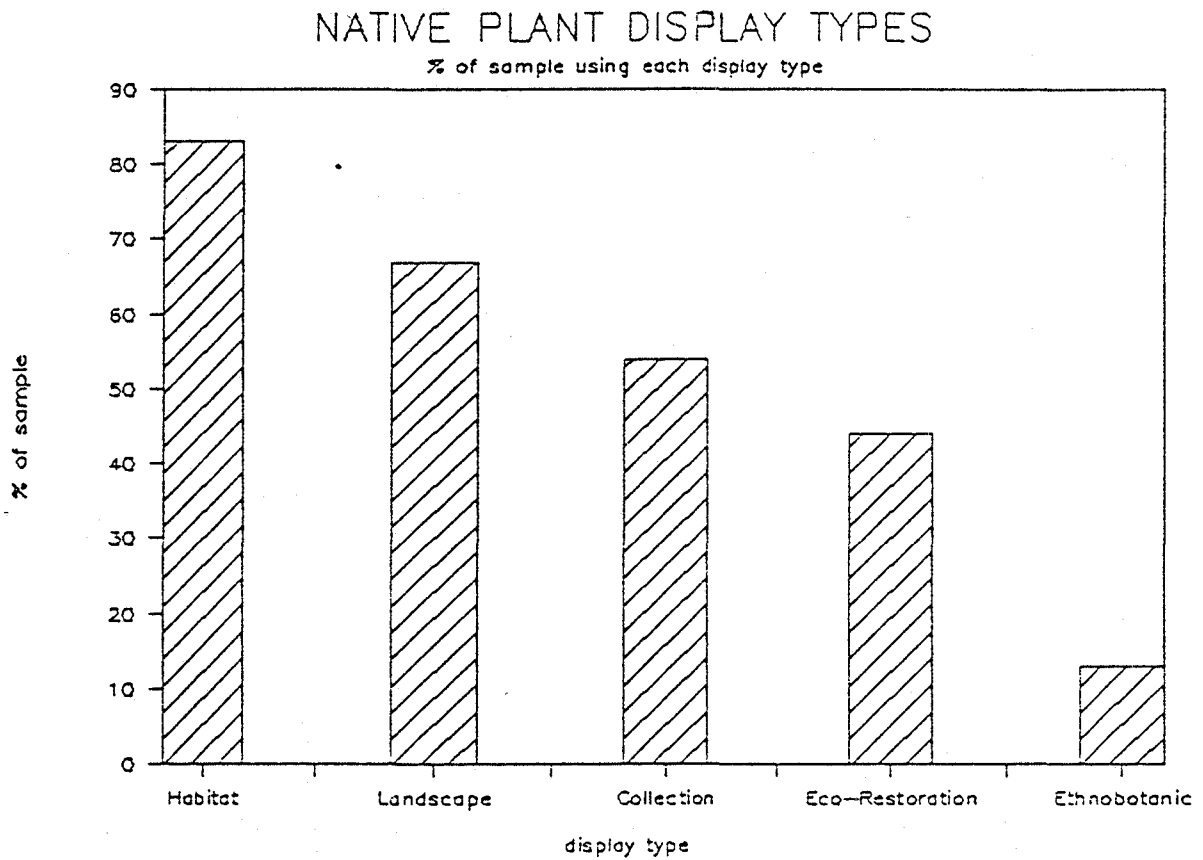


Figure 4 Percentage of gardens sampled using various native plant display types

descriptive terms, like Woodland Edge or Northern Forest. At some gardens, native plants are arranged according to geo-political boundaries, with display titles like Southern Texas, Delaware County, Forests of Tennessee conforming to political or geographic factors rather than ecological parameters. Yet the most botanically sophisticated method is the use of precise terms identifying the distinguishing plant content of the displayed community. Sinoloan Thorn Scrub, Pinyon Juniper Woodland, and Texas Mesquite Brush are typical of this increasingly common approach to native plant display terminology.

Objectives. Respondents were asked to rank the priorities motivating their institution's native plant work. The two most important objectives in native plant activities for most of the institutions are 1)educating the public about the importance of plant conservation, and 2)interpreting and presenting natural history. Three priorities of secondary importance for most of the gardens are: 1)providing aesthetic experiences for visitors, 2)promoting natives as landscape plants, and 3)conducting research relating to natives. At a single institution, native plant selection and breeding is the number one priority.

Visitors. As the experience of visitors is a primary focus of this thesis, it is important to examine the visitors and interpretive methods of gardens offering habitat displays. At 47% of the gardens surveyed, native plant displays are a secondary attraction important to only a few visitors. Thus, many of the people experiencing native displays are likely to have come to the garden for some other type of feature.

Survey respondents were also asked to consider their observations of garden visitors and estimate the percentage who come for an educational experience vs. a recreational experience. Most respondents perceived nearly half (46%) their visitors as seeking relaxation and recreation rather than information.

Whether a garden's visitors are first-time or repeat is an important issue in interpretation and orientation (Ransely, 1988). Though very few of the respondents had conducted visitor surveys, they estimated that 41% of their visitors were repeat visitors from the local community, with close to 60% of all their visitors experiencing their displays for the first time. As will be discussed, a preponderance of first-time visitors poses special challenges for a habitat display.

Interpretation. Interpretive materials and methods for native plant habitat displays parallel those found in most other types of botanic garden exhibits (Wise, 1979). Eighty-seven percent of the gardens use identification labels for most of their plants, 75% offer guided tours, 65% use information pamphlets, and 62% utilize story labels. Seventy-one percent of the gardens have an in-house staff member with special training or experience pertaining to interpretation and/or education.

Native Plant Habitat Displays: A Future Trend in Public Gardens?

Many leading designers (Jones, Coe, Paulson, 1976, Polakowski, 1987) creating displays in gardens, zoos, and aquaria advocate the exhibition of plants and animals in a habitat context, emphasizing the link between organism and environment. In agreement with this trend, survey results suggest habitat displays represent a strong future direction in the exhibition of native plants. Of those gardens founded within the past 10 years which display natives, 88% are using habitat exhibits. Moreover, when asked to describe future native plant exhibits, most respondents alluded to plant community exhibits of naturalistic design with strong ecological

themes.

Thus, across the country, gardens and many zoos will create native habitat simulations intended to convey appreciation and information to visitors. The educational success of these exhibits will depend upon understanding the needs, expectations, and overall experience of the habitat display visitor. Toward this goal, on-site studies examining the nature of visitor experience are seen as essential to the improved design and interpretation of native plant habitat displays.

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CHAPTER 2

NORTH CAROLINA BOTANICAL GARDEN: A CASE STUDY

For purposes of better understanding the mechanics and functioning of a habitat display, a case study was conducted at North Carolina Botanical Garden (NCBG). Field research closely examined the interactions between staff, visitors and the physical features of NCBG's habitat displays. The study's ultimate goal was to identify the factors influencing the effectiveness of a public garden habitat display in imparting information and appreciation to visitors. Specifically, the case study research sought to accomplish these objectives:

- 1) Identify, through staff studies, the specific goals, objectives and methods of a habitat display.
- 2) Examine the behavior and perceptions of visitors to identify levels of response and understanding.
- 3) Describe habitat display design and

interpretation issues important to building visitor awareness and appreciation of native plants.

North Carolina Botanical Garden

NCBG is a facility of the University of North Carolina, located in Chapel Hill. First opened in 1961, the Garden's central area (NCBG also manages a campus arboretum and several off-site natural areas) covers over 227 acres, offering visitors two basic types of features: 1) uncultivated Piedmont vegetation with interpreted nature trails; and 2) cultivated garden displays of various themes in a five-acre enclosed area surrounding Totten Center, NCBG's administration building.

NCBG was chosen for this study partly because of its long-standing commitment to the habitat display of native plants. NCBG is recognized as a national leader in the field of native plant display and public garden conservation advocacy (Jones-Roe, 1987). Also important, was its staff's strong interest in enhancing the effectiveness of their habitat displays through visitor study techniques.

NCBG is representative of the kinds of institutions presenting native plant habitats in that

native flora display and promotion is an important organizational objective. A 1988 publication by White, Mission, Goals, and Objectives of the North Carolina Botanical Garden, recounts the Garden's diverse native plant features and programs:

The display, interpretation, and propagation of southeastern plants has been a past emphasis of the Garden. The development of this theme has included the display of naturalistic habitat gardens, the display of plants in more traditional horticultural settings (the Perennial Beds), the rare plant program, and the development of the nature trail system through natural Piedmont woodlands. ...The native plant theme supports directly the importance of conservation in the mission of North Carolina Botanical Garden.

Though an important focus, NCBG's themes and programs are not entirely devoted to plant conservation and native flora, nor are its garden displays restricted to native plants. Other display themes include herbs, plant families, and aquatic plants. Programming relates to many interests, ranging from flower shows to sculpture exhibits. Staff activities are equally diverse, encompassing horticultural therapy, myriad educational programs, field ecology, and other programs. In short, native plant habitat displays are one of a number of attractions drawing people to the site, and a single dimension of a diverse institution. Field research was restricted to those visitors touring the cultivated

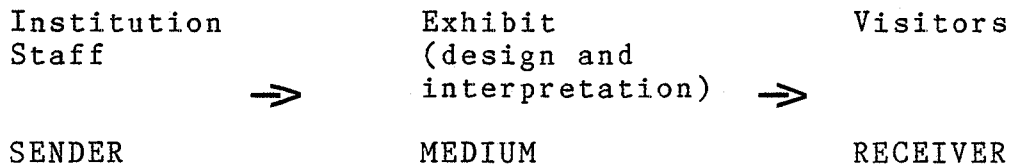
display area and those staff members whose activities influenced their experience.

Study Methods and Results

Field work was conducted in the fall of 1988, occurring over a ten day period in late September and a second, four day effort in early October. This timing allowed for maximum flower color in the habitats and also cooler, more hospitable weather for visitors (weather during this period was highly variable, bringing both hot and humid, and cool, rainy days). Though the appearance of the garden gradually changed as various plants came in and out of bloom, the overall quantity and distribution of floral interest remained largely consistent. A garden sculpture exhibit and the annual meeting of the NCBG Foundation Members took place concurrent with the study, perhaps slightly increasing visitation. Otherwise field work examined a typical early fall period at NCBG.

The habitat display at NCBG was interpreted as a type of educational exhibit. An educational exhibit is defined here as a collection of objects and/or living things arranged and interpreted for the purpose of conveying information, or imparting appreciation, to visitors. The success of educational exhibits requires a

clear transmission of targeted information, through design and interpretation, to a comprehending and receptive visitor. The successful transmittal of information or imparting of appreciation by an exhibit is, therefore, seen as a one-way, three-part transaction. It involves the institution and its staff (the sender), the exhibit's design and interpretation (the medium), and the visitor (the receiver).



To gain understanding of the dynamics of a habitat display required a holistic approach, carefully examining all three of these components. Thus, the methods of this study focused on: 1) the display (physical form of the habitat's design and interpretation); 2) staff members; and 3) garden visitors. Methodology will be described in these three categories.

The Display

NCBG's habitat displays focus on the broad geographic areas of North Carolina. The state is divided into three physiographic regions: the Coastal Plain, Piedmont, and Mountains. As Chapel Hill is located in

the Piedmont, NCBG's two habitat displays, the Mountain and Coastal Plain, serve to give local visitors a glimpse of the vegetation found in other parts of the state. The Mountain and Coastal Plain habitat displays are located contiguously within the enclosed, cultivated garden area surrounding Totten Center (Figure 5).

Understanding the role of habitat displays in visitor experience at NCBG begins with analysis of the display site. Figure 5 shows the habitat's spatial relationship to the buildings, other display areas, and the main entrance. Arrows indicate typical visitor movement through the complex observed during the study period. Entrances to the habitat areas are labeled A, B and C. Visitors coming through the main entrance would usually ignore entrance A to the habitats and go into the Herb Garden instead. They would then go around the Totten Center, through Plant Families, Aquatics, Carnivorous Plants, and then, either double back out of the garden, or move down to the habitat's back corner location, entering through B. Indeed, the underuse of Entrance A and the remote location of Entrance B proved to be significant influences on visitor movement. (Note: Entrance C was closed off to accommodate study methods, thereby altering normal visitor movement).

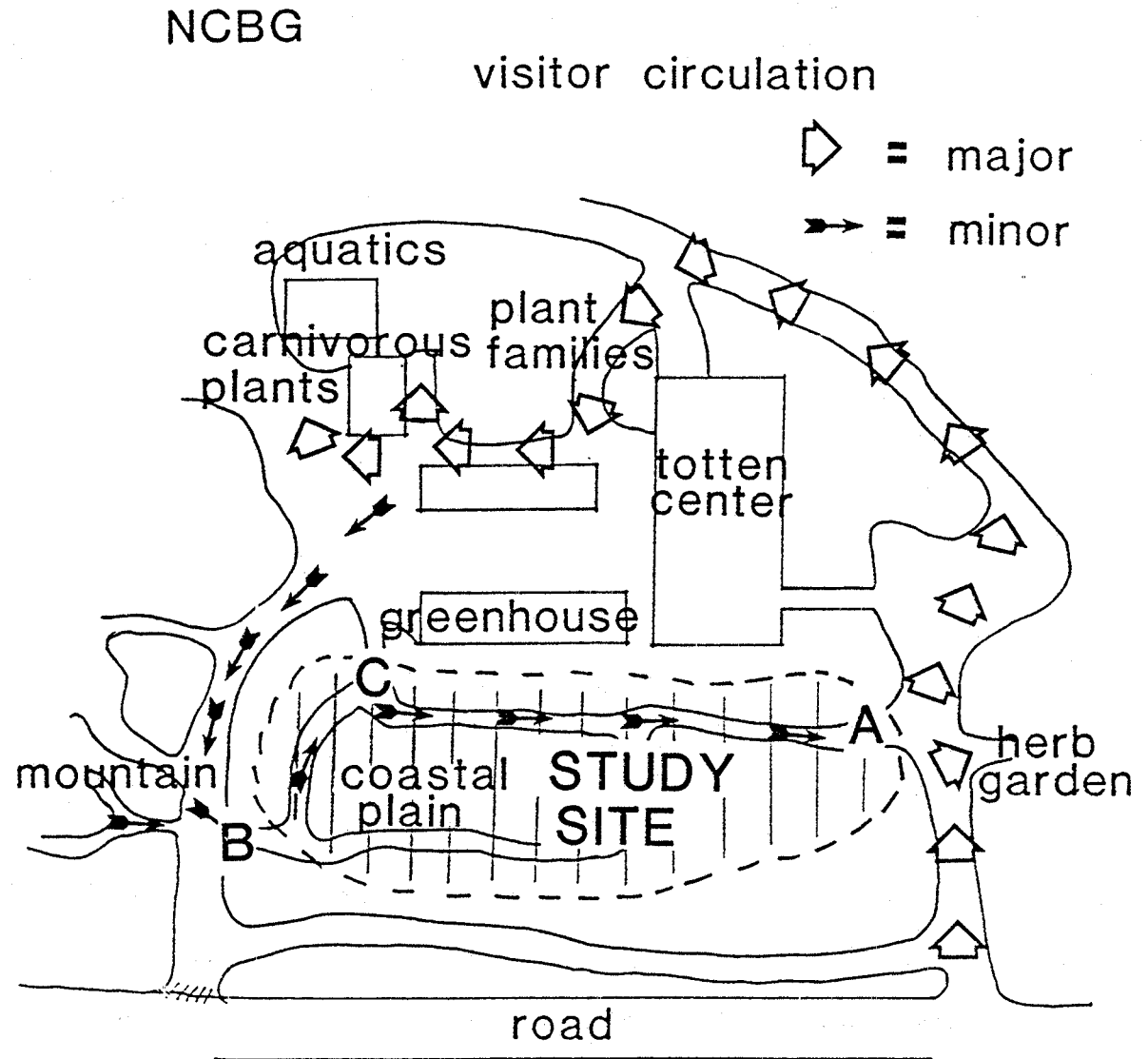


Figure 5 NCBG Study Site: circulation and position of various features in Totten Center complex

The logistical requirements of the study's research methods restricted the amount of NCBG's habitat area that could be included in the study. Because study methods required an area small enough to allow full observation of all visitors within, research focused only on the Coastal Plain display, omitting the Mountain habitat area. In addition, to maintain consistency, all subjects had to travel the same route through the Coastal Plain display. Consequently, several path options were blocked with vegetation and rows of weathered wooden stakes. Figure 6 diagrams the 420 ft. route used for the study. To insure that study subjects experienced the aspects of the habitats considered important by staff, the selection of this route was made in consultation with the habitat area's Curator.

The Coastal Plain display consisted of several plant community types which occur within the region. Figure 6 shows the location of the Sandhill, Pocosin, Pine Savannah, and Swamp communities within the display (other communities are represented, but on a scale too small for study purposes). Also indicated, are non-habitat, landscape plantings of native shrubs and trees along one edge of the habitat area.

The Coastal Plain display included a number of

NCBG STUDY SITE

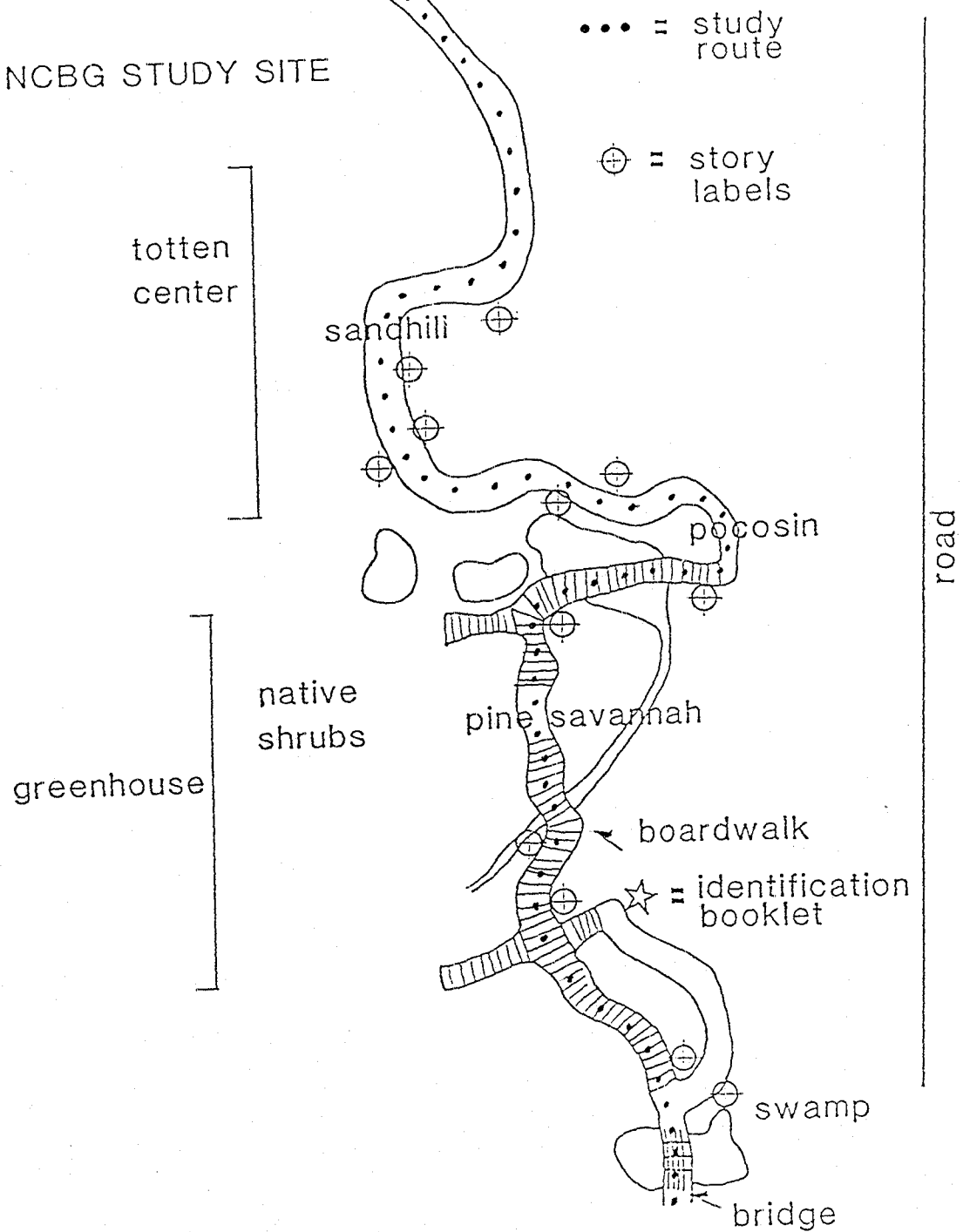


Figure 6 Route through habitat display used for all phases of the study

signs intended to orient visitors, identify plants, and interpret the habitat's contents. Along the 420 ft. study route, there were 58 black plastic identification labels, an identification booklet containing plant photographs, 11 story labels, and three orientation signs identifying the boundaries and locations of the habitat types. Figure 6 shows the location of the story labels and identification booklet.

Interpretive signs provided the only on-site information source for visitors. Identification labels included both the scientific and common names of plants. Story labels consisted of a graphic illustration and paragraph of information explaining plant adaptations and unique aspects of the habitat. A typical story label is shown in Figure 7. The identification booklet contained several pages of color photographs of Pine Savannah display plants in flower, with information about the plant's provenance, bloom season, and habitat preferences (Figure 8). The back section of the book described the story of the Pine Savannah's construction.

Surrounding scenery comprised another important site characteristic influencing the experience of visitors. The effects of "borrowed scenery" have long been a primary consideration in landscape design and are



Figure 7 Typical Story Label

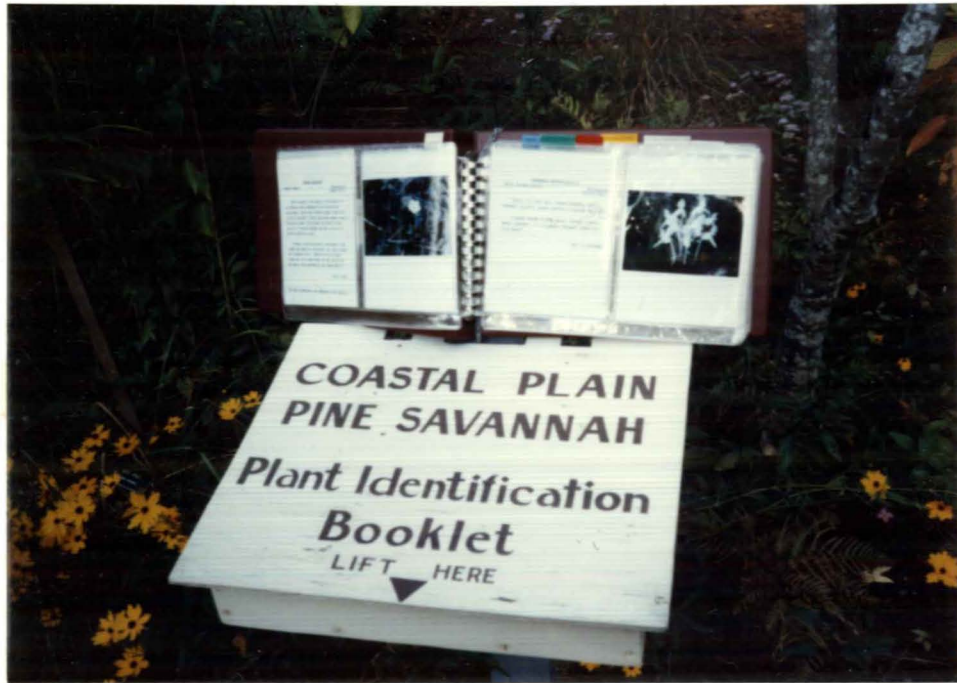


Figure 8 Identification Booklet

an important consideration in habitat recreations (Jones, Coe, Paulsen, 1976). At NCBG, landmarks and materials foreign to the Coastal Plain visually imposed along the borders of the display site. In several locations, "holes" in the edge plantings allowed visitors to see the road, the fence, other displays, and the Totten Center.

Staff Study Methods

Those NCBG staff members closely associated with the habitat displays and/or visitors were asked to contribute facts, insight and opinion to the study. Their input was considered essential for a number of reasons. Because staff members are responsible for the design, interpretation, and maintenance of the habitat displays, they best understand the exhibit's intended goals and function. Moreover, because they have daily contact with the habitats and visitors, some staff members were intimately familiar with visitor response to the habitat area. Therefore, staff studies at NCBG sought to identify the goals, mechanics and functioning of the habitats as seen by the individuals closest to them. Toward this end, selected staff subjects participated in three study techniques: 1) Questionnaires; 2) Interviews; and 3) Staff-Employed Photography.

Questionnaires

A total of 12 staff members completed a questionnaire (Appendix 2) surveying their view of the goals of native plant display at NCBG, the mechanics of the habitat display's functioning, and their impressions of visitor experience. Participants were selected for their familiarity with NCBG displays and visitors, or because of their direct involvement with design, interpretation, and/or maintenance of the display.

Staff Interviews

Each of the twelve staff members completing the questionnaire was also interviewed. The interview method used broad, open-ended questions (Appendix 3) to elicit additional information about the same issues addressed by the questionnaire. Participants were also asked questions specific to their work at NCBG and to their experience with visitors.

Staff-Employed Photography

Some designers of habitats describe the means by which their displays convey information as experiential in nature-that visitors learn and come to appreciate by

seeing, hearing, smelling and touching the life of a habitat. However, identifying the components and evaluating the effectiveness of this "experiencing" of a display is highly problematic. While many people are able to articulate their reaction to a sign or a pamphlet, they may have difficulty describing what it is that draws their eye in a natural setting or causes a display image to register in their minds. Moreover, techniques that rely on recall, such as interviews and surveys, may lack the immediacy necessary to accurately record the non-specific qualities of a habitat display experience. In short, the study required a technique that could record the visual impressions of both staff and visitors without the limitations of verbal and written communication inherent to interview and survey techniques.

Adapted from Cherem and Driver (1983), Staff-employed Photography is a method devised to inventory staff perceptions of the habitat display. Cherem and Driver's Visitor-employed Photography used cameras to measure common visitor perceptions of natural environments. Visitors traveling along a nature trail or rafting river were issued completely automatic cameras and instructed to photograph the most attractive, unappealing or interesting scenes, depending on the purposes of the

study. Scenes and images photographed by 10% or more of the subjects were termed consensus photos. These scenes were then identified on a site map and the resulting information used to inventory an area's scenic resources.

For the purposes of this study, the technique was used to inventory the staff's visual impressions of the habitat display's intended function. The eight staff most closely involved with the habitats were issued a 35 mm. automatic focus camera with these instructions:

Photograph the images you think are most important to accomplishing the habitat area's educational goals - specifically, those visual elements and scenes you would hope the average visitor would find most interesting, and would figure most prominently in their experience of the habitat area.

Subjects were told that if they wished, they could walk the path (as defined for this study, shown in Figure 6) once before they began photographing. The camera contained 24 exposures of film, though the subjects had the option of taking anywhere between 0 and 24 pictures, depending on how many images they felt merited photographing. Subjects were provided with paper and clipboard and instructed to record the significant content of the photos and their reasons for selecting each image. Staff were asked not to discuss with one another the content of their photo selections. Staff photography

usually took place in the early morning before visitors arrived, thereby minimizing the influence of concurrent visitor activity.

Staff subjects took an average of 20 photos, usually taking 30 minutes or more to complete the exercise. Photos were then grouped according to both their specific content (particular plants or display areas) and general theme (types of plants or areas). Images photographed by three or more staff members were inventoried (Table 1) and located on a site map.

Table 1 Images photographed by three or more staff members

<u>Image</u>	<u>No.of photographs</u>
boardwalk	11
<u>Sarracenia</u>	9
savannah vistas	9
sandahills	9
bridge and pond	8
plant identification	7
pocosin	6
ponds	6
<u>Pinus palustris</u>	6
<u>Kalmia cuneata</u>	6
<u>Ilex verticillata</u>	5
signs of fire	4
identification booklet	4
coastal plain entrance sign	3
<u>Aristida stricta</u>	3
<u>Quercus laevis</u>	3
Long leaf pine sign	3
swamp	3

Staff Study Results

While field work was being conducted, NCBG was in the midst of a master planning process which addressed many display and visitor issues. Consequently, staff brought a great deal of forethought and opinion to their considerations of the habitats. Much to the benefit of this study, they were enthusiastic about its goals and extremely cooperative in their participation.

Questionnaires and Interviews

Because the questionnaire and interview studies touched upon the same basic issues, staff responses from the two methods will be discussed together in this section. Staff information about the habitats falls into three categories: 1) Goals of the display - What is the display trying to say to the visitor?; 2) Mechanics of the display - How does the display convey this message?; and 3) Perceptions of visitor experience - How effectively does the display communicate with visitors? - What new knowledge do they take from the habitats?.

Goals of the Display. An important objective of the staff study was to identify the purpose of habitat displays at NCBG. Staff were asked both in interviews and by the questionnaire: Why, in your opinion, are these

habitat areas part of your institution? On this point, the staff seemed to share a fairly strong consensus of opinion. Most cited the habitats as an important expression of the NCBG's commitment to conservation, education, and research:

The plant communities of the southeastern United States and their ecology are central to the Garden's mission and the goals of conservation, education, and research.

Other staff respondents described the unique power of the habitat displays to introduce visitors to plant communities and to conservation issues, emphasizing NCBG's conservation goals and activities:

(the habitat's role at NCBG is)...to use the display to educate the visitors about the beauty of our natural areas and the importance of our natural areas and the need to preserve natural areas and to describe the issues relative to rare plant protection and NCBG activities relative to conservation through propagation.
(sic)

A few staff members went on to allude, with some pride, to NCBG's long-standing tradition of displaying natives in habitat gardens. All staff shared a perception of these displays as an important part of the institution's identity and purpose.

As is evident in the above quotations, the habitats were perceived by staff as serving to impart knowledge to visitors. Staff were asked to describe, in

specific terms, the educational message conveyed by the habitat displays. Three basic elements were identified: 1) biological diversity as a part of North Carolina's heritage; 2) the dependence of plants and other organisms on specific environmental conditions; and 3) the need for conservation.

Every staff respondent mentioned cultivating awareness of North Carolina's rich natural heritage as central to the habitat's educational message. This awareness was described by some as instilling pride as well as appreciation and understanding:

To see the beauty and diversity of the North Carolina landscape will hopefully instill a greater sense of pride in native North Carolinians, as well as non-natives, so they will want to preserve their native heritage.

...that there's a valuable diversity in both plants and wildlife which conveys a wonderful aesthetic image to those who take the time to appreciate it! (sic)

Understanding ecological principles and environmental relationships was also considered central to the habitat's message. Several staff members expressed hope that visitors would, while appreciating the beauty of the plants, also understand the fragile nature of their existence. One staff member emphasized imparting aesthetic appreciation but went on to say: "visitors will

realize many beautiful plants depend on very specific environmental factors and physical events (fire, dry sand, seepages) for survival."

As almost a natural consequence of visitors appreciating North Carolina's diversity and its ecological fragility, some staff members hoped they would keenly sense the need for conservation. As one put it, "To know - is to appreciate - is to protect." Indeed, some staff felt that the habitat's educational message revolved around this point, not only informing but calling the visitor to action: "Natural habitats are being lost at a rapid pace in North Carolina and elsewhere. Support from the public is needed now for protection!"

Mechanics of the Display. The staff was generally less clear in describing the specific means by which the display conveyed its educational messages. Some staff members placed great emphasis on the power of experiencing the habitat displays:

Experiencing the garden first-hand: walking up the hot sandy path in the Sandhills, walking along the level boardwalk through the Savannah, walking into the dark densely grown Pocosin Section, etc. (sic)

Others questioned whether the habitats actually succeeded as an experiential learning tool: "(visitors learn by) reading signs or being on a guided tour - probably very

little from experiencing."

The staff's opinion on the effectiveness of interpretive signs was much more consistent. All staff felt that interpretive signs, tour guides, and the identification booklet played at least a small role in conveying information to visitors.

Perceptions of Visitors. Staff were asked to describe how they perceived the average visitor's reaction to the habitat displays. Some staff members described a wide range of responses, detailing how visitors of different mindsets might react to the habitats:

I think an average visitor who already likes native plants and appreciates natural areas is very enthusiastic about our display. Others, particularly visitors from the country and farming areas enjoy learning the names of weeds that they are familiar with or remember from childhood. Some love to see familiar plants given status with plant labels and cultivation. Others wonder why we are growing such weeds... and quickly go through the habitats with a bewildered expression on their faces.

Over half of the staff surveyed emphasized confusion and bewilderment in describing visitor response to the habitats. Others felt visitor response was dependent on whether they were a first-time or a repeat visitor to the habitat area:

I would guess the new visitor enjoys the walk through the habitat areas but picks up and retains few of the intended messages - one or

two impressions at best. However, we have many repeat visitors through the area, and some of these people actually absorb most of the concepts intended. I would guess that repeat visitors enjoy the habitat collection areas very much.

Several NCBG staff felt that the response of new visitors was not positive and strong enough to accomplish the goals of the display. They suggested improving orientation to the themes of the habitat display to better prepare the first-time visitor to appreciate its significance.

A closely related question asked staff to describe what the average visitor was actually learning from his or her experience in the habitats. Again some staff qualified their answer based upon the type of visitor, pointing out that those willing to seek out information could learn a great deal. However, most staff subjects viewed visitor learning in the habitats as involving one or two basic messages; "Wild areas can be beautiful" and another; "That these areas actually exist, hopefully they can see the beauty in the wildness of it." One individual concisely summarized staff opinion on this point:

- 1) That there are many kinds of habitats in North Carolina and in the Southeast - more than they realized. 2) That the habitats these plants grow in are somehow different from each other.

Staff-Employed Photography

Staff-employed Photography was used to inventory the visual elements of the habitats which staff felt were most important to conveying the display's educational message. As the instructions specified: "record the images which you would wish to figure most prominently in the experience of visitors." The resulting photos and accompanying written descriptions serve to simulate a journey across the study area through the collective eyes of NCBG staff--as they would wish it to be perceived by the visitor. The experience of the habitat, as photographed by staff, consists of the following elements and themes: visual character of plant communities, structural elements, plant beauty, story labels, specific plants, water features, plant identification, and fire (Table 2).

Table 2 Staff Photograph Categories (Some photos placed in two or more categories. Not all photographs categorized)

Visual character of -	20%
plant communities	
Structural elements -	20%
Plant beauty -	17%
Story labels -	15%
Specific plants -	14%
Water features -	11%
Plant identification -	9%
Fire -	4%

Accompanying staff comments explain the roles these elements are thought to play in the visitor's experience of the habitats.

Visual Character of Plant Communities. As mentioned, the Coastal Plain display area consists of four distinct plant communities: Cypress Swamp, Pine Savannah, Pocosin, and Sandhills. Staff took 33 photos intended to capture the visual character of one of these habitats. Comments often described broad structural characteristics: "Dark moist, heavy plant growth of Pocosins... deep, lush and impenetrable" and "Swamp environment with water, moisture tolerant herbaceous species and cypress - A micro version of the real thing." All staff stressed the need for visitors to recognize distinctions between the different plant communities, and leave with some awareness of their unique visual qualities.

Structural Elements. Of the 161 staff photographs, 33 were of the bridge and boardwalk. Notably, these man-made structures were seen as important elements of a display striving to present a natural setting. As explained in their comments, staff saw the bridge and boardwalk as functional elements which also communicated important information about the Coastal Plain environment.

The bridge (Figure 9) entrance to the habitat consisted of an attractive wooden structure transversing a small pool of water. It was photographed by three staff subjects, all of whom emphasized its ability to signal the presence of water: "bridge is inviting and lets us know we are entering a water world."

The boardwalk (Figure 10) was photographed by all the staff. It was seen as one of the most important design features because of its ability to communicate the importance of water to the Coastal Plain: "A reminder that the Savannah is a fragile wetland community." Also, the boardwalk was seen as an object of beauty and interest:

Looking back at the really beautiful curves of the boardwalk. Just walking through on the boardwalk is for me an aesthetic experience. Also, standing here, one feels the heat of the sun.

Plant Beauty. Many plants and groups of plants were photographed because of their aesthetic appeal. A total of 28 photographs were taken simply for the beauty of the image with no specific information content mentioned. Color, texture, and composition were cited as attractive elements meriting the attention of visitors. Among the most photographed plants was a Ilex verticillata in fruit. Typical of staffs' comments about plant beauty in the habitats, their remarks emphasize the physical



Figure 9 Bridge



Figure 10 Boardwalk

accessibility of plants: "Ilex verticillata - this natural beauty at fingertips enhances interest in surroundings... I like the ability to lean over and get close up to plants." In addition to describing a plant's aesthetic qualities, some staff mentioned its importance as bird food or as a garden ornamental, hoping the visitor would be aware of a plant's value to people and animals as well as its beauty.

Story Labels. Story labels are the primary interpretive instruments of the habitat display. Staff took 24 photos of story labels, identifying them as an integral part of the visitor's experience in the habitats. Some comments concerned the importance and appeal of the information presented:

(Pond Life sign) The fact that there are many interwoven stories/uses/life histories between plants and animals...good sign."

Overall, staff described story labels as serving two main purposes: 1) conveying ecological messages such as the uniqueness of habitats and the need for conservation; and 2) making visitors aware of the more subtle aspects of the habitat, encouraging them to take the time to observe and appreciate.

Specific Plants. Particular plants were perceived by staff as being emblematic of certain plant communities

or ecological themes. They were photographed not for their eye-catching flower or fruit color but because of the meaning they held for staff and/or visitors. For instance, all staff photographed Pinus palustris (Figure 11) with this remark being typical: "long-leaf pine really gives a sense of the Sandhills--and is an interesting species in its response to this environment (sic)." Quercus laevis, Aristida stricta, and Taxodium distichum were also frequently photographed because they were seen as representative of certain plant communities.

Sarracenia (Figure 12) were photographed by all staff as an important Coastal Plain display component. They were emphasized not as an ecologically critical element but as a plant holding great appeal for visitors. Carnivorous plants are displayed elsewhere at NCBG and are felt to be one of the garden's most popular attractions. Several staff in photographing Sarracenia, noted their appeal to visitors and stressed their importance as a theme: "Its important to hit visitors with the fact that this is the habitat where most all carnivorous plants are found." Indeed, one staff member suggested that pitcher plants should be an even more visible habitat element: "Pitcher plants on the edge of the Sandhills seepage need to be labeled (sic)! We need to make more visible use of



Figure 11 Pinus palustris



Figure 12 Sarracenia

carnivorous species within the habitats!" Other plants photographed because of their meaning or interest to visitors included Opuntia and Yucca. Staff stated that these plants symbolize to visitors a desert environment, and effectively evoke the arid heat of the Sandhills.

Water Features. Water, as an essential component of the Coastal Plain environment, is emphasized in the display with four ponds, bridge and boardwalk, and several interpretive signs. Not surprisingly, its importance to the survival of the displayed plant communities was a theme in 17 staff photos. Comments emphasized the general importance of water, "Water-the dominant mold of plant life in the Coastal Plain," and also the relationship between moisture and specific plant species, "Different water depths contribute to the richness of the flora of the Coastal Plain, see the water lilies, Hydrocotzle, and Rhexia...(sic)."

Plant Identification Labels. The importance of effective plant identification in the habitats was the subject of 14 staff photographs. The comments of staff clearly indicate that some see plant identification as an area for improvement in interpretation of the habitats: "Where or what is the Blue star (sic)" and "I'm confused as a visitor. What am I supposed to see here." Others

photographed instances of clear plant identification:

"Very good. I have no doubt what or which plant is the silky dogwood (sic)." Staff photos and comments indicated strong awareness of visitor interest in learning plant names.

Fire. Each spring, the Coastal Plain display is deliberately burned to renew vegetation, mimicking a natural process upon which this ecosystem depends. Throughout the year, evidence of this burn remains in the form of fire-scarred trunks and blackened stumps. These fire remnants and fire dependent plants were photographed by 6 staff. Their comments emphasized the importance of fire to specific plants: "Very rare plants such as this legally protected shrub (Kalmia cuneata) are dependent on fire and special environmental conditions."

Visitor Study Methods

Visitor study methods examined the behavior and perceptions of visitors in order to identify their levels of understanding and appreciation. While staff studies sought to understand the intended purpose and function of the habitat display, visitor studies assessed to what degree the display was reaching visitors and actually achieving its purpose.

Visitor studies utilized three methods: 1) Exit Interviews, 2) Visitor-employed Photography, and 3) Behavioral Observations. All methods were deemed equally important, and time was allocated evenly among the three. Each visitor subject participated in one of the three methods. Field work alternated from one method to another to minimize dissimilarities between samples. Visitor studies took place concurrently with staff studies, ensuring that staff and visitor subjects experienced the habitat display under identical conditions. During the week, generally every visitor to the habitats would be asked to participate in one of the study methods. Heavier visitation on weekends limited participation to every third or fourth visitor. A total of 148 visitors participated in the study, with only one individual declining to partake.

Exit Interviews

Forty-seven visitors were interviewed as they exited the habitat display. The interview method followed the guidelines of naturalistic evaluation as established by Wolf (1979) for museums and zoos, and as adapted to public gardens by Price (1986).

Naturalistic evaluation assesses an exhibit based

upon the responses of visitors to broad, probing questions. The technique depends upon engaging visitors in an open-ended, natural conversation about the exhibit. The object is to make the visitor feel at ease and encourage them to use their own language to express their feelings and opinions regarding an exhibit experience. As Wolf points out, the resulting information represents the actual interaction between the visitor and the exhibit as perceived by the interview subject:

...naturalistic evaluation depends upon relating natural behaviors and expressions to the context in which they arise. In this sense, it ensures that persons involved in or affected by the program (exhibit) in question has an opportunity to describe and assess their experiences and to comment on what those experiences mean to them.

A basic list of questions was developed (Appendix 4) to cover a few basic topics and initiate conversation with each visitor subject. In keeping with the naturalistic method, some flexibility was maintained and the visitor's perspectives and concerns would often determine the course of the interview. Interviews would usually last four to ten minutes and would conclude with the offer of a packet of wildflower seeds as a gesture of appreciation.

Visitor-employed Photography

Visitor-employed Photography (VEP) was used to record visitor perceptions of the habitat display. As established by Cherem and Driver (see page 26), the technique was particularly well suited for studying NCBG habitat visitors.

For many of the visitors, the Coastal Plain habitat display represented a completely foreign environment. It was felt that such unfamiliarity with the habitats might compromise the ability of visitors, particularly those visting for the first time, to clearly verbalize their experience in the display. Effectively circumventing this constraint, VEP offered a non-verbal and immediate means of recording the subject's visual impressions of the habitats. Moreover, it was a relatively neutral instrument that could be used in a generally consistent way by a diverse range of subjects; the simple act of peering though a view finder and clicking a shutter conferred no advantage to the habitat display regular, nor handicap to the first-time visitor.

Visitor photographers used the same camera and followed the same route through the habitats as did the staff photographer subjects. Like the staff photographers,

visitors were told that they could take between 0 and 24 exposures. However, the instructions for visitor subjects differed in that they were asked to photograph those images which they personally found most interesting (staff were asked to photograph the images they would most want others to see). Also, so as not to hinder spontaneity, visitors were not asked to write down any information regarding their photo selection. Visitor subjects were instructed to:

Please photograph those images of the garden which you find to be most interesting - those images which attract your attention.

We are not interested in the quality of your photographs but the images they capture. This is meant to be a fun and interesting experience, so please, take your time and enjoy yourself!

Two to four visitor photographers participated each day, usually half in the morning, half in the afternoon. After completing their photography, the subjects were interviewed using the same procedures and questions as for interview subjects. In addition, visitor photographers were asked to describe the pictures they took. Predictably, some subjects could describe practically every picture taken while others struggled to recall just two or three.

A total of 31 visitors participated, taking over

360 photos. To categorize the types of things visitors photographed, visitor photos were grouped by overall theme. Some photos were placed in more than one theme category. This approach allowed photographs differing in specific content but similar in visual theme to be grouped together. Thus, visitor photographs were placed in 7 broad categories: 1)Water, 2)Individual plants without bloom or fruit color, 3)Individual plants with bloom or fruit color, 4)Wildflower landscapes, 5) Visual character of plant communities, 6)Signs and labels, and 7)Insect life.

Additional analysis followed Cherem's precedent of terming images photographed by 10% or more of the subjects as consensus photos. This approach provided an inventory of those elements and scenes having particularly strong impact on the visitor photographers. Going by specific content, 31 objects or scenes, such as the holly or bridge, were taken by 10% or more of the subjects (three or more) and are termed consensus images (Table 3).

Visitor Observations

Sixty-seven visitors were observed as they moved through the habitat area along the same route as did the staff and visitor photography subjects. Because of the 420 foot length of the study route, it was necessary to

Table 3. Visitor Consensus Photographs; images taken by three or more visitor subjects

<u>Subject</u>	<u>No. of Photographs</u>
<u>Sagittaria</u>	12
View of pond from pond life story label	10
View of pond north from boardwalk	9
View of pond south from boardwalk	9
View of pond near greenhouses	8
Large <u>Yucca</u> clump	8
Small <u>Yucca</u> specimen	8
<u>Sarracenia</u> near Seepages story label	8
<u>Solidago</u> closeup	8
<u>Ilex verticillata</u>	7
<u>Opuntia</u> (large clump)	7
<u>Cornus amomum</u>	6
Mature <u>Pinus palustris</u>	6
<u>Rhexia</u>	6
View of <u>Typha</u>	6
<u>Marshallia</u>	6
<u>Hibiscus coccinea</u>	6
<u>Pinus palustris</u> seedling	6
<u>Aristida stricta</u>	6
<u>Eupatorium</u> on boardwalk	6
<u>Impatiens capensis</u>	5
<u>Viburnum nudum</u> fruit	5
<u>Pinus serotina</u>	4
Grass seed-heads	4
<u>Aesculus pavia</u> - small specimen	4
<u>Eupatorium</u> near booklet	4
Dead <u>Pinus taeda</u> bark close-up	3
<u>Aesculus pavia</u> - large specimen	3
Small <u>Taxodium distichum</u> tree	3
Identification Booklet	3
<u>Sarracenia</u> along boardwalk	3
<u>Opuntia</u> (small clump)	3

move with, or trail the observed subject through the display. To escape detection, observations were made from inconspicuous locations under the guise of studying insects or flowers. This strategy provided for fairly close observation which included recording visitor response to specific signs and overhearing conversation relating to the habitats. Separate site maps were used for recording each visitor observation. A system of notation was developed to record the following behaviors: general body language and movement, reading of signs, glancing at signs, touching of plants, stops along route, and the total time spent in the habitats.

Visitor Study Results

The results of the visitor study provide a vivid picture of visitor reaction to the habitat displays. Analysis focuses on determining: 1) how effectively the display imparted habitat information and appreciation to visitors and, 2) what visitor and display-related factors influenced the effectiveness of the display.

Exit Interviews

Visitor interview subjects have been categorized according to the level at which they understood and appreciated the habitats. The analysis of the interview

data of each subject asked three fundamental questions: 1) Did the individual understand what the habitat display represented?; 2) Did the individual find the habitat display interesting and/or attractive?, and 3) What factors influenced their response to the display? Answers were found in the individual's responses to these interview questions:

Why did you come to the garden today?

Overall, what attracted your attention in this area of the garden?

Why do you think this garden was constructed?
What do you think is its purpose?

Overall, what did you think of this area of the garden?

If you could make any changes you like, what would you do to improve it?

These questions elicited, in most all cases, information revealing the level at which the subject understood and appreciated the habitat display. Through analysis and comparison of interview responses, all subjects have been placed in one of the following three categories:

Category 1) The Comprehending and Appreciative:

Roughly forty percent of the interview sample fully understood what the habitat display represented and appreciated its content. All of these subjects expressed full awareness of most of the educational messages of the

display. "To show endangered habitat areas" and "to give an overview of the plants of North Carolina" were typical of Category 1 subjects' explanations of the display's purpose and message.

Significantly, 65% of the "Comprehending and Appreciative" were repeat visitors. They tended to come to NCBG for fairly specific reasons: to see particular plants, to learn, to see "interesting things." They were more likely than any other visitors to refer to specific plants or themes in the display. Though the "Comprehending and Appreciative" would refer to the story labels in a positive light, many would also comment that they had not, that day, read them. Some subjects, who were repeat visitors, stated that they were aware of the story label information and now focused their attention on plants. Indeed, these people seemed to arrive at the garden possessing the knowledge and interest necessary to key in on the more subtle aspects of the habitat, such as fire ecology or the role of moisture level. By virtue of their interest in the display's subject matter they were, in a sense, presensitized to understand its purpose, deriving both information and enjoyment. In recommending changes for the display, these visitors often requested additional plant identification, more horticultural

information, and the addition of specific plants to the habitat. These visitors tended to be nature lovers, avid gardeners, people who enjoy wild areas--in many ways they shared the mind-set of NCBG staff.

Typical words used by Category 1 visitors to describe the display:

intriguing
fascinating
authentic
diverse
complex

Category 2) The Perplexed But Appreciative:

Approximately 30% of the subjects did not fully understand the habitat display's purpose, but were appreciative of its content and the experience it offered. Many of these visitors left the display with minor misconceptions, such as seeing the habitat as a preserve for endangered plants or as a meadow-garden demonstration. Yet despite their confusion about the purpose and message of the display, the habitat provided these people with a somewhat stimulating and positive experience. Indicative of Category 2 visitor response, one subject remarked, "We didn't expect a garden like this. Its a little confusing, but we weren't disappointed by it!"

Seventy percent of the "Perplexed but Appreciative" were first-time visitors. Category 2

visitors were less likely than Category 1 to be interested in specific features at NCBG. Many stated that they had come to the garden simply to enjoy a nice day, do "something" with their families, or "see something pretty." They sensed the naturalness of the display and in some cases learned about native flora or ecology. In fact, the "Perplexed but Appreciative" were the most likely of all interview subjects to praise story labels and describe them as helpful. These visitors, though perhaps confused about the purpose of the display, found it novel and often expressed an interest in learning more about it. Their willingness to pause and read signs reflects their aroused curiosity.

Typical words used by Category 2 visitors to describe the display:

natural
colorful
swampy
confusing
overwhelming

Category 3) The Uncomprehending, Indifferent, and/or Repelled: Roughly 30% of the interview subjects did not understand the habitat display at all, and, in some cases, were repelled by its appearance. Their negative response to the display was expressed in comments such as "Nothing in there caught our attention. It looked like a field ditch" and "It looked hot and uncomfortable. It

didn't look interesting and I couldn't see any color."

Eighty-five percent of the "Uncomprehending" were first-time visitors. They were extremely unlikely to refer to any specific plants or themes in the display, picking up on few, if any, of its educational messages. Category 3 visitors were very unlikely to state they had come to NCBG to see particular features. They were the most likely of the three groups to be interested in "seeing pretty things" or "just relaxing." Very few of this group read story labels. Most of them expressed little interest in acquiring information and seemed more focused on an aesthetically pleasing experience. As one subject put it. "I came here to see flowers not read signs." These people sometimes did not even enter the habitat display (a significant number of visitors, up to 30% on some days, were seen to exit NCBG without having entered the habitat display area). They tended to perceive the display area as a non-public area, as lacking color and not worth seeing, or as an area NCBG plans to develop sometime in the future. In recommending changes for the display, these visitors tended to request more color, "more things that bloom." Some Category 3 subjects expressed a willingness to learn more about the display if more of an explanation was provided.

Typical words used by Category 3 visitors to describe the display:

wild
depressing
messy
weedy
overgrown
uncomfortable

These categories of visitor response provide a useful framework for evaluating the effectiveness of the display. The display clearly provided a positive, educational experience for visitors in Category 1, achieving many of the goals identified by staff, as described earlier in this chapter. For Category 2 visitors, the display's message was not entirely apparent, yet it did manage to pique their curiosity and, in most cases, stir aesthetic appreciation. Only for Category 3 visitors was the display's purpose totally frustrated.

Visitor Employed Photography

The 360 photographs taken by visitors capture a diverse range of objects and scenes. Interpretation of visitor photographs requires determining in what manner they reflect the visitor's visual impressions of the habitat.

If we accept the face value of instructions issued to visitor photographers, then their photos represent

those elements of the display which they found most interesting and attention-grabbing. However, as Chenoweth (1984), a landscape researcher using VEP points out, other possible interpretations abound.

It could be argued that subjects use the camera in a highly erratic or biased way that is unrelated to their encounters with landscape features. For example, subjects might take a few photographs early on and then burn the rest of the photos merely to complete the task. ...VEP photographers may be enacting the role of a composer of scenes rather than reacting to the landscape... examination of recent photographs and response sheets does not indicate that such a phenomenon was occurring.

Though Chenoweth dismissed these possibilities in the case of his own study, they do pose important questions concerning the photographs of NCBG visitors. Do these photographs represent the perspective of the average visitor experiencing the display? Do the subjects, who are issued a camera and special instructions, react to the habitat as would the typical visitor?

Based upon interviews with visitor photographers after their picture-taking (who were asked the same questions as exit interview subjects), the answer to both questions appears to be no. Visitor photographers, on the whole, absorbed far more information during their visit than the average exit interview subject. Furthermore, visitor photographers were more likely to refer to

specific display plants or themes, and much more likely to mention story labels and other interpretive devices. Not surprisingly, they spent an average of 15.9 minutes in the display, over ten minutes more in the display than the average observation subject (see observation results).

This evidence suggests that the photography procedure had the effect of concentrating the subject's attention on the visual content of the display. That is, their efforts to photograph interesting aspects of the display heightened their awareness, resulting in a more directed and focused experience than that of the average visitor. Put simply, their photographs may represent the impressions of people who explore and "go looking" in the habitat display. In this sense, their photographs perhaps reflect the visual experience of "Appreciative and Comprehending" NCBG visitors.

As described, visitor photographs have been categorized according to overall theme. Where available, interview data are cited in discussing the significance of these theme categories. Discussion includes prominent consensus images (objects or scenes photographed by three or more subjects) in each category.

Table 4 Visitor Photograph Categories (some photos have been placed in more than one category. Not all photos have been categorized).

Water -	32%
Individual plants - without bloom or fruit	24%
Individual plants - with bloom or fruit	21%
Wildflower landscapes -	10%
Habitat landscapes -	7.5%
Signs and labels -	5%
Insect life -	4%

Water. Water, in the form of water features or aquatic plants, was the dominant theme in over 32% of the photographs. Particularly common, were scenes of the center pond taken from the boardwalk and near the "Pond Life" sign (Figure 13). Nymphaea and Sagittaria were the most frequently photographed images in this category. Not surprisingly, the ponds and aquatic plants were also a major topic in photographer interviews. The water lilies were specifically mentioned as interesting by over half the photography subjects.

Individual Plants without Bloom or Fruit Color.

Over 24% of the visitor photographs were of plants exhibiting no floral or fruit color. Despite an abundance of plants with flowers or colorful fruit, plants without represent the largest category of consensus images (15). Overall, visitor photographers paid closer attention to individual non-flowering plants than did staff



Figure 13 Center Pond

photographers. In referring to these plants in the interviews, many remarks reflected interest and curiosity, such as, "It was interesting to see plants like cactus and yucca - I didn't know those things would grow here (sic)." The 88 photographs in this category attest to the visitor's interest in plants which arouse interest because of their novelty, as well as those that stimulate aesthetic appreciation with floral color.

Based upon photographic content, interpretive signs successfully directed the attention of visitor subjects to specific plants. Six and one-half percent of the photographs prominently included a plant described by a story label. Sarracenia, Pinus palustris, and Aristida stricta were all consensus photographs. Plants with interpretive signs were among the most frequently mentioned topics in interviews. Those who photographed these plants typically remarked "I liked the way signs pointed out various parts of the garden." Often visitors would mention photographing one of these plants and then comment on the accompanying sign: "I enjoyed reading about the turkey Oak - the way it turns up its leaves is interesting" and "I liked the way you could see the young long-leaf-pine and then compare it to the mature (sic)".

Individual Plants With Bloom Or Fruit. Twenty-one

percent of the photos focused on individual plants with flowers or colorful fruit. Marshallia, Rhexia, Solidago, Viburnum, and Ilex were among the 8 consensus photographs in this category. Notably, Rhexia, Eupatorium, and Solidago could have been photographed in several locations along the study route. However, in each instance, most of the photographers selected the same individual plant, usually a particularly floriferous specimen immediately adjacent to the boardwalk. Indeed, the few extreme close-up photographs taken by visitors were of flowering plants along the boardwalk (Figure 14). Interview responses would often single out these plants in reference to their color, such as "I loved those little blue flowers (sic)" or "those red berry fruits sure were pretty (sic)."

Wildflower Landscapes. Wildflower scenes comprised a major theme in visitor photographs. Over 10% of the photos centered on compositions of color involving masses of several different species of plants in flower. Most of these photos were taken in the Pine Savannah, usually including Aster, Coreopsis, Solidago and Eupatorium. Many photographers emphasized the beauty of the habitats in interviews and described "masses of wildflowers" or "the yellow and blue flowers together" as a focus in their photo-selection.



Figure 14 Flower Close-up

Habitat Landscapes. Photographs of habitat landscapes capturing a broad area of the display comprised 7.5% of the photos. Some subjects specifically mentioned the overall qualities of certain areas, "I like the shady areas with the overhanging branches (Pocosin)," indicating that the overall appearance of the habitat was interesting or eye-catching. Certainly, their photos demonstrate that a few subjects considered the broader character of an area, in addition to focusing on nearby objects and surroundings.

The landscape photographs are a useful measure of the amount of attention received by the three major plant community areas within the display. Thirteen broad landscape photographs were taken of the Pine Savannah, 13 of the Sandhills, and 6 of the Pocosin. However, very few subjects specifically mentioned these communities in interviews. Of all the communities, the Sandhills area was most prominent in interview responses, usually referred to in a negative light, such as: "the Sandhills sure were boring, we didn't like it as well as the rest of the garden." Similarly, when several subjects were prompted to comment on the different areas within the display, most made reference only to the Sandhills by its given name. The Pine Savannah was described often as the

"wildflower area" or as the "meadow." A couple visitors alluded to the Pocosin indirectly, saying "it reminded me of an area I used to hunt in" and "I liked ducking under the branches in that really overgrown area."

The total number of photographs, of all types, taken in each plant community gives some indication of subject responsiveness to that area of the display. Of those photographs that can be clearly assigned to one area, 125 photographs were taken in the Pine Savannah, 83 in the Sandhills, and 18 in the Pocosin. Dividing the total footage of path in each community by the total number of times it was photographed yields: 1 photo every 1.12 feet in the Pine Savannah, 1 photo every 1.8 feet in the Sandhills, and one photo every 2.5 feet in the Pocosin. Clearly, the Pine Savannah, with its abundance of floral color, stimulated the most photographic activity.

Signs and Labels. Five and one-half percent of the photographs featured identification labels, story labels, and the identification booklet. Photos of plants which were carefully composed to include identification labels are placed in this category (Figure 15). Consistent with the content of these photographs, the interviewees emphasized their interest in learning plant names, and many suggested the addition of clearer plant



Figure 15 Prominent Plant Identification

identification as an improvement to the habitat.

Though only a few subjects photographed story labels, a larger percentage mentioned them as interesting in the interviews. Comments such as "The signs are very helpful, they highlight the most interesting information," were typical.

Insect Life. The habitats in full fall flower hosted an array of bees, wasps, butterflies, spiders, mantises, reptiles and birds. Visitors pointed out, with 4% of their photographs, that as Solidagos and Eupatoriums arch across the boardwalk, the life they host is literally in the face of the visitor. Visitor photos revealed fairly close observation of the insects, with several close-ups of butterflies and of praying mantises (Figure 16).

Visitor Observations

Price (1986), in her study of demonstration gardens, identified two categories of visitors based on observed behavior; Browsers and Studiers. Browsers were characterized by their lack of interest in learning while the studiers were typified by their active attempts to gain knowledge from the gardens. Observed visitors at NCBG can be similarly divided. The behavior which indicated learning in the NCBG habitat displays is,



Figure 16 Insect Life in the Pine Savannah

however, most accurately described as exploring; defined here as unstructured observation and investigation of the display environment. The "Explorers" are, therefore, those visitors who appeared to find the habitat display engaging and actively investigated its contents. The "Browsers," as defined in this study, scanned some of the display's plants and interpretation but in a quick, cursory manner without sustained investigation. In addition to the visitors described above, others were clearly just passing through the display to other destinations and made no attempt to experience the display environment. To a very limited extent, the display was used as a circulation route by some visitors.

Among the most significant behaviors exhibited by visitor subjects was the total amount of time they spent in the display (Figure 17). Most all visitors moved through the habitats with a consistent pace to their movements and a definite pattern to their pauses and stops. On the average, Browsers would spend a little over 3.5 minutes in the display while Explorers tended to spend close to 6 minutes. As a benchmark, it should be noted that walking the 420 ft. study route required a little over 2 minutes. To pause in a couple of places and read two or three of the story labels required approximately 3

Time Spent in Habitat Display.

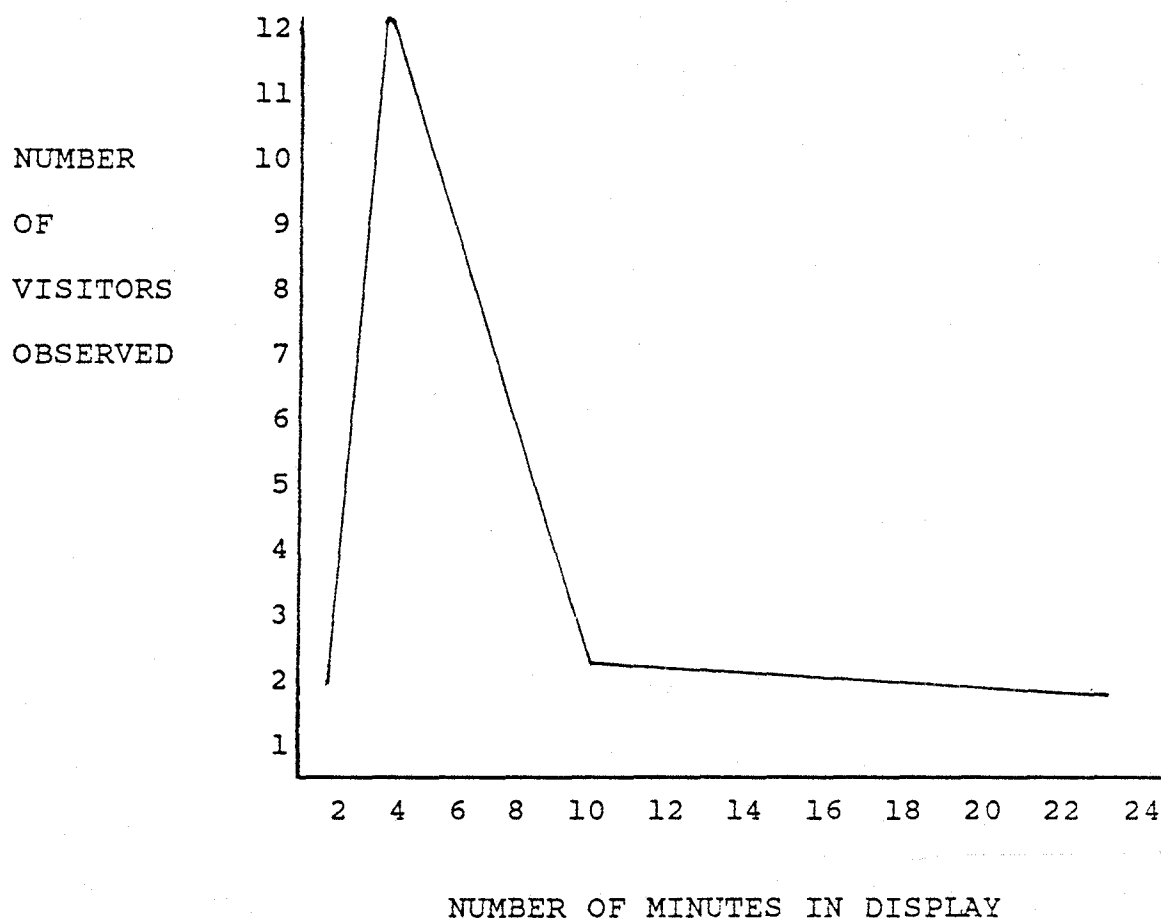


Figure 17 Time Spent in Display by Observed Visitors (67 subjects observed)

minutes.

The Browsers comprised nearly half of the observed visitors (44%). Their behavior in the display was usually limited to walking through at a steady pace with relatively few stops. Also typical, was a tendency to glance at rather than read story labels, to kick or push at plant material arching into the path, to stop mostly in areas with water features, and to engage in social behaviors unrelated to the habitat display experience. Not surprisingly, this group was also the most likely to fail to complete their trip through the display, occasionally doubling back out through the entrance by which they entered.

The behavior of the Explorers, roughly 38% of the sample, is in striking contrast to that of the Browsers. These visitors tended to connect much more strongly with the plants and interpretive materials of the display, as is evidenced by the larger amounts of time they devoted to the experience. Indeed, subjects observed spending above average amounts of time in the display often exhibited behaviors indicative of appreciation and learning, including interactions with interpretive materials, interactions with plants, and interactions with each other. The lone exceptions were those visitors

spending long periods of time in the display engaged in social interaction or children's play.

Interactions With Interpretive Materials. Story labels were the primary information source for display visitors, and especially important for the Explorers. Though Explorers were only slightly more likely to stop at labels than the Browsers, the two groups differed significantly in the amount of time they spent label reading. Visitors who spent over four seconds with a label were thought to be actually reading it. Based on this measure, Explorers (avg. 4.5 labels), on the average, read twice as many story labels as Browsers (avg. 2.2 labels).

Furthermore, Explorers were more likely to be lead by label information into further investigation. Often, when reading labels pertaining to a specific plant, these visitors would scan the surrounding area to locate the described species. In the case of the White Wicky (Kalmia cuneata) story label, they would sometimes spend several moments searching for the Wicky. The turkey oak (Quercus laevis) label which describes the adaptive purpose of the plant's leaf arrangement prompted many of the Explorers to locate and study the leaves of a nearby Turkey Oak.

The Explorers also exhibited a strong interest in learning the names of plants. They would bend down, lean and reach to more clearly see identification labels or locate the plants with which the labels identified. Many of Explorers seemed fascinated by the identification booklet. Those spending 10 minutes or more in the display, would often use the booklet as a tool for learning plant names. They were observed studying the color photographs and information and then actively searching the Pine Savannah area for the described plants. Several visitors were seen to return to the booklet two or more times.

Interactions With Plants. Most characteristic of the Explorers was their eagerness to touch, smell, and closely inspect the plants of the display. Especially in the Pine Savannah area, these visitors would reach out and touch nearby flowers, often pausing to sample their fragrance. Also, they would stop in their journey to focus on areas of the display, as if scanning for interesting plants. Some Explorers would closely inspect a single flower for several moments or bend down to examine smaller herbaceous plants. Solidagos and Eupatoriums were subjects of special interest because of their floral display as well as the many colorful bees and wasps they hosted. Perhaps most revealing of the explorer's attitude

toward the display plantings was their response to plants arching across the path and partially obstructing passage. Rather than brush or push aside these plants as did some of the Browsers, the Explorers would, with care and perhaps respect, gently move them away.

Interactions With Each Other. Close observation of visitors allowed conversations to be overheard and interactions charted. Most notably, Explorers would often share their insights and learning with others in their party. Bitgood (1987) refers to the phenomenon of triangulation in which visitors share their impressions of a display or object, saying "more exciting exhibits appear to act as a catalyst for social interaction between visitors". The plants and interpretive materials of the display stimulated a great deal of interaction between the members of Explorer visitor parties. Most typically, the Explorers would discuss specific plants or information from a story label. Usually one individual would serve as the leader or teacher, sharing his or her insights and knowledge with others in the group. This behavior was most commonly evident in use of the identification booklet. The Explorers would study the booklet and then search as a group for the depicted plant. Overall, investigation of the display was often a shared and social experience for

the Explorers.

Discussion and Conclusions

The case study methods interpreted the NCBG habitat displays as a type of educational exhibit, intended to impart knowledge and appreciation to visitors. Visitor and staff studies revealed that the display's educational purpose was accomplished through certain informal learning behaviors: reading of interpretive materials, and experiencing and interacting with the life of the display. "Comprehending and Appreciative" interview subjects and "Explorer" observation subjects were shown to exhibit the desired knowledge and appreciation of the habitats, or engage in learning behaviors leading to knowledge and appreciation. In contrast, the "Uncomprehending and Indifferent" interview subjects and the "Browsers" did not exhibit knowledge gain or the desired behaviors of exploration and learning. Factors influencing the very different experiences of these visitors are described in two categories: Visitor-Related Determinants and Display-Related Determinants.

Visitor Related Determinants

Exhibit evaluation studies conducted in museums (Koran et al. 1984) indicate that though the design of an

exhibit is important, it is the visitor's perspective that often determines levels of appreciation and learning. Visitors arrive with a compelling history of interests, concerns, and biases--all of which may dictate the nature of their interaction with an exhibit.

In agreement with this view, the personal perspectives of NCBG visitors strongly influenced levels of receptivity and comprehension. Familiarity with NCBG, its habitat displays, or the displayed plant communities proved to be a powerful determinant of visitor experience. Case study results demonstrate that the degree to which visitors were observed to engage in learning behaviors, or exhibit high levels of appreciation and learning in interviews, was largely dependent on four factors, all at least partly related to familiarity: visit purpose, expectations, personal background and interests, and wayfinding ability.

Visit Purpose. Interview subject response to the question "Why did you come to the garden today?" revealed a wide range of motivations for visting NCBG. Among repeat visitors, these purposes were consistent with the kinds of experiences to be found at the gardens. Indeed,

76% of all repeat visitors came to NCBG to enjoy some specific, familiar element of the garden.

Of all interview subjects, those coming to the NCBG for a specific purpose related to the garden's content were the most likely to reveal learning and high levels of appreciation. Over 50% of the subjects in the "Appreciative and Comprehending" interview category had come to the garden for a specific garden related purpose, such as "to learn about plants," "get some ideas for my garden" or "gather chestnuts." As stated, these visitors were predominantly repeat visitors and their previous knowledge of NCBG, their familiarity, largely determined their visit purpose.

For first-time visitors however, the reason for visiting did not often coincide with the purposes of the habitat displays. Over 60% of the all interview subjects came to NCBG to enjoy some form of relaxation and/or recreation. Of these visitors, 86% were coming to NCBG for the first-time. Stated in various ways "it was a nice day to be outside," "we're out to see the sights," or "we wanted to go for a nice walk," the promise of pleasant surroundings for relaxation was a predominant theme. Compared to visitors coming to NCBG for learning or to see specific features, visitors seeking relaxation were much

less likely to have learned specific information from the display or to express high levels of appreciation. Indicative of their reaction to the display, these visitors make up 90% of the "Uncomprehending and Indifferent."

Predictably, visitors using the garden primarily as a social setting were unlikely to respond as affirmatively as those coming for specific garden features. Fourteen percent of the interview subjects had come to the garden to socialize. This purpose was commonly reflected in statements such as, "I wanted to spend the afternoon with my daughter and this seemed like a nice place," "I wanted to show the garden to my girlfriend," and "We're spending the day with relatives, showing them the town." Few of these visitors expressed appreciation for the habitats and most all of them were in the "Uncomprehending and Indifferent" category. Though exploration of the habitats was often a social experience, social interaction did, for some visitors, work to exclude attention and interest away from the habitat display.

Expectations. Closely linked to visit purpose, visitors usually arrived at NCBG with specific expectations of the experience awaiting them. Again, familiarity was a powerful determinant. As "Appreciative

and Comprehending" interview subjects were predominantly repeat visitors, they were well aware that NCBG does not feature formal gardens and came expecting more unconventional features, such as the habitats.

In contrast, expectations of visitors coming to the garden for the first time often centered on "more showy" and "more formal" types of public garden displays. Importantly, these visitors did differ in their reactions to finding the unexpected and unfamiliar habitat display. Though the "Unappreciative and Indifferent" were unmoved and even repelled by the habitats, many of the "Perplexed but Appreciative" visitors were open to experiencing the displays and reading labels. This disparity in reactions to finding the unexpected can partly be explained by the personal background and interests of visitors.

Personal Background and Interests. The personal background and interests of visitors were shown to strongly affect response to the habitat display. Regardless of whether subjects were first-time or repeat visitors, if they had previous experience with Coastal Plain flora or were familiar with, or interested in the regional characteristics of North Carolina, it was likely the display would stimulate some interest and appreciation. These visitors, who had encountered the

plants in another context, would often relate to the display in a personal way. Comments such as "I've always seen these plants from the side of the road" or "that one over there is a weed all over my pastures" reflected the visitor's recognition of past experience with the plants. These visitors would sometimes express surprise and pleasure in seeing familiar "weeds" cultivated in a botanic garden.

Similarly, special knowledge relating to botany, horticulture, or natural history would often stimulate interest in the display regardless of visit purpose or expectations. Visitors having an interest in history, Native American culture, meadow gardening, wildflowers or carnivorous plants all expressed appreciation for the habitat. Though perhaps unfamiliar with the habitats, the special interests of these visitors allowed them to make sense of the display by relating it to pre-existing knowledge.

Wayfinding ability. As mentioned in discussion of the NCBG site, the habitat display entrances were problematic in location and design (Figure 5, page 26). One entrance, just inside the main gate was poorly marked with no indication of the display's presence or purpose. The other entrance, at the far end of the habitats

adjoining the bridge, was in a remote location that required the visitor to pass down an uninviting service road for access. Compounding this problem, most visitors moved through the NCBG garden complex along the same single route which happened to circumvent views into the habitat that might draw them inside.

In regard to the wayfinding challenges of NCBG, it is likely that familiarity with the gardens had an important impact on use of the display. First-time visitors were at a marked disadvantage as they tried to find their way through the garden complex. Some visitors felt that the habitat display's low profile at NCBG communicated that the display was not intended to be part of their visit, saying: "We didn't want to go in there because it didn't look like it was open." Another visitor found it frustrating that such an exhibit would not be more clearly marked:

It looked like the side of a road or a part of the garden you haven't done anything with. How do you expect people to go in there? Just like a store, if you want to do business you got to hang up a big sign, you got to at least let people know what you got.

During four days of the study, the percentage of NCBG visitors touring the Totten Center complex without seeing the habitats display was estimated. On some days, up to 30% of the visitors left the garden without seeing

the habitats. It is likely that many of these people were first-time visitors unaware of the habitat display's presence at NCBG.

Display-related Determinants

Display related determinants are those physical features of the habitat display which elicited similar behavior patterns in most visitor subjects. They are the display elements which prompted uniform patterns of response regardless of visitor expectations, visit purpose, or personal interests and knowledge.

The power of these display-related determinants substantiates a basic tenet of exhibit design: that exhibit elements are capable of consistently shaping behavior and response across a broad visitor population. Numerous researchers have demonstrated the power of the exhibit, illuminating the effects on visitors of label design, lighting, and various spatial arrangements (Falk et al., 1985). This perspective on the exhibit-visitor interaction views behavior modification through design as an important strategy for achieving educational effectiveness.

The functioning of the NCBG habitat displays, as described by staff studies, assumed the display would

influence visitor behavior, stimulating learning and appreciation. This projected behavior would include visitors experiencing the habitat, reading interpretive materials, and lingering to explore the display.

NCBG staff subjects identified, through Staff-employed Photography and interviews, a range of images and types of perceptions intended to influence the experience of visitors. To measure the impact of these targeted images on visitor experience, Visitor-employed Photography requested subjects to photograph those elements of the display which caught their attention and/or that they found interesting. Figure 18 maps the location of visitor photographic activity. Many of the features targeted for visitor focus by staff did in fact "grab the attention" of the VEP subjects. Visitor photographers captured the floral beauty of the display, water-related elements, and characteristic plants. Significant correlation between visitor and staff photographs suggest that, at the very least, many targeted display images do have impact on particularly attentive visitors, as represented by the VEP subjects.

Analysis of behavioral observations further confirms the behavior-determining influence of certain habitat display elements. The locations of images

VISITOR PHOTOGRAPHS

* = one to two
photos

◊ = 3 or more
photos

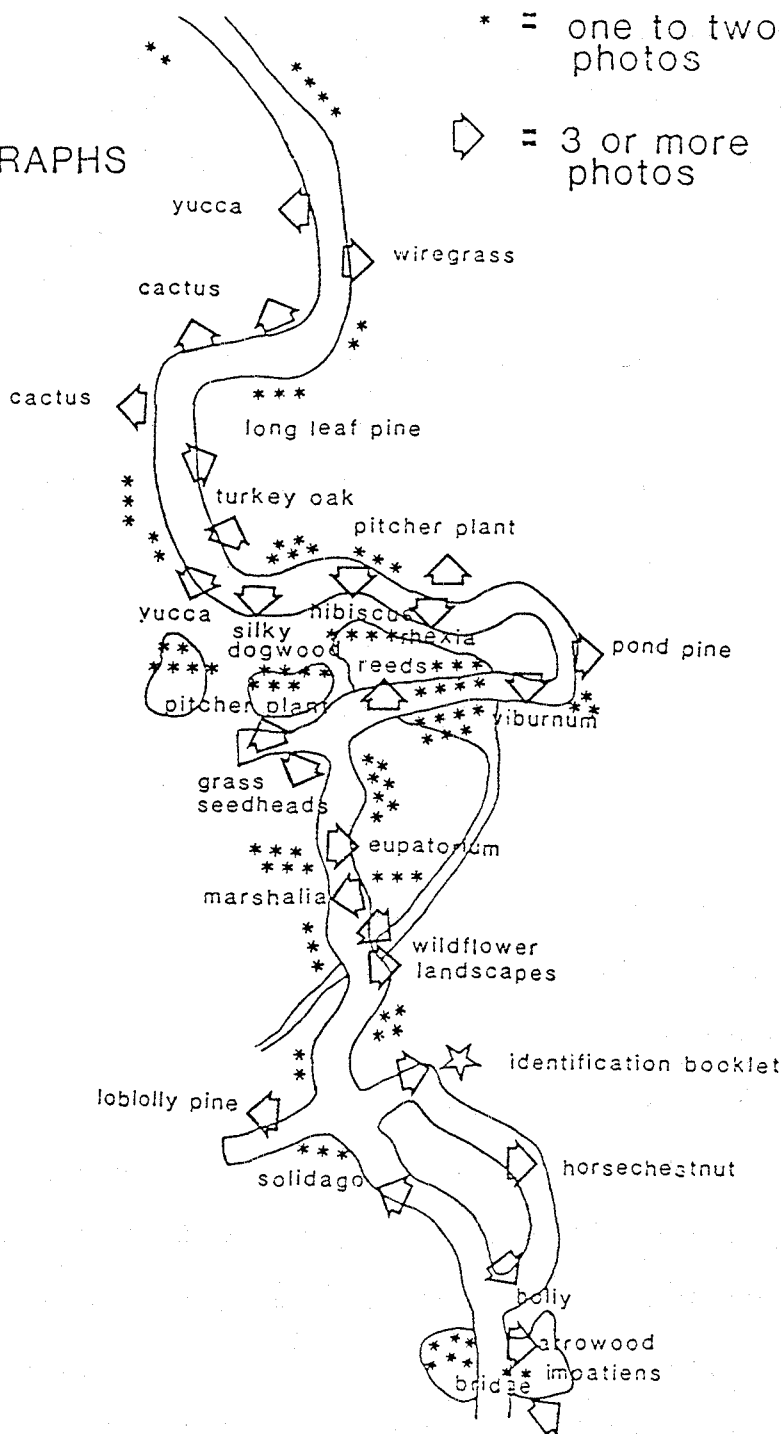


Figure 18 Locations of Visitor Photographs

photographed by staff and visitors also figured prominently in the experience of observation subjects. Figure 19 delineates observed behavioral patterns; locations where visitors stopped and gazed, read signs, and/or explored are indicated. When compared with Figure 18, visitor behavior is shown to parallel the location of visitor photographic activity. And, as hoped by staff, visitors were observed to focus on display water features, the characteristic plants of plant communities, and interpretive labels.

Explanation for the power of these features and areas to attract visitor attention and influence behavior is found in the concept of Perceptually Exciting Nodes (PENS). In Cherem and Driver's (1983) study of visitor interest along nature trails, Visitor-employed Photography identified areas of high perceptual interest as PENS. As the authors explain, "The more that is 'happening' at any one spot, the more that spot is likely to be perceived as interesting by a large number of people." In the case of his nature trail study, "happening" areas were those that presented diversity, complexity, novelty, mystery, or bore strong visual patterns. Another source of perceptual excitement were edge areas exhibiting dramatic visual contrasts in vegetation type, degree of enclosure, or

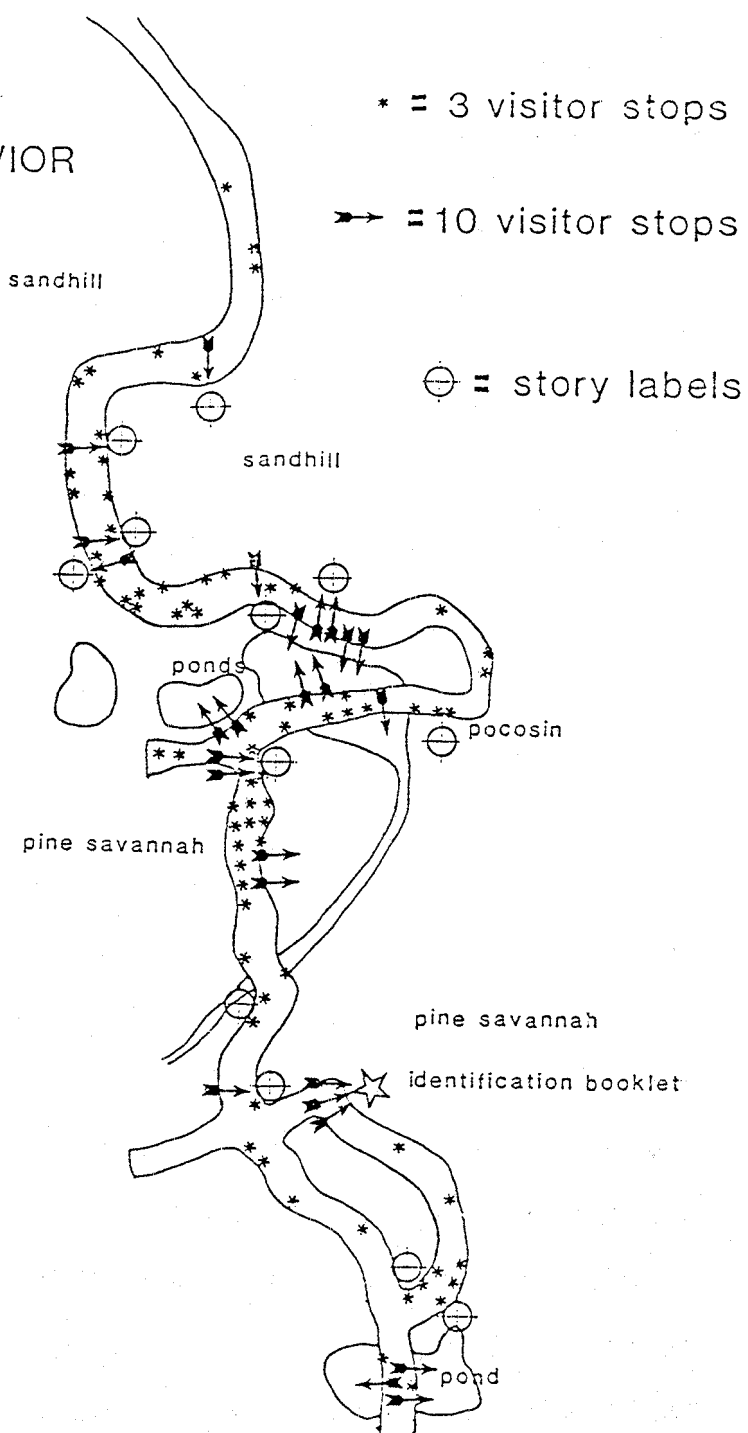
OBSERVED
VISITOR BEHAVIOR

Figure 19 Locations of Observed Visitor Behavior

scale. These visual elements created perceptual excitement which was shown to influence visitor behavior along the trail.

Study results have pinpointed certain areas and features as sites of perceptual interest consistently stimulating exploring and learning behaviors in NCBG visitors. These patterns of visitor response are mapped by juxtaposing visitor photographic data with observational data. The resulting schematic presents a two-dimensional view of visitor response to the habitat display, encompassing both behavior and visual impressions. Using this combined data, Figure 20 codes the intensity of visitor response to various areas of the display. Areas of particularly intense visitor response (PENS) are marked with a letter. As shall be discussed, visitor interest in these PENS is stimulated by the perceptual excitement of water features, interpretive signs, floral color and edges between vegetation types - and the aggregate effect of these elements. Nodes A, B, C, D, and E contain the types of habitat elements which stimulated perceptual interest and, consequently, exploring behaviors in NCBG visitors. For most visitors, the images contained within these nodes comprise the visual highlights of their journey through the display.

VISITOR RESPONSE
OBSERVATIONS AND
PHOTOS COMBINED

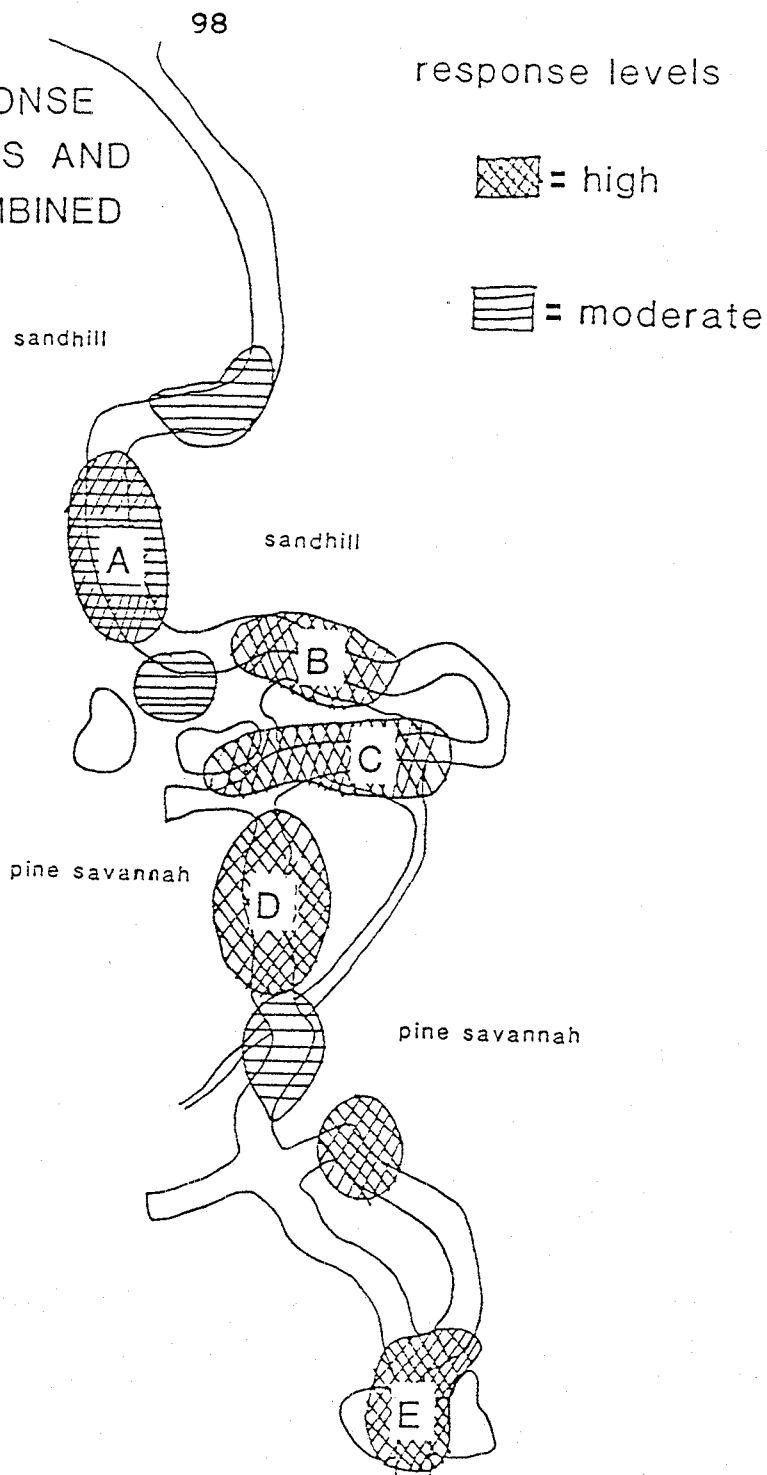


Figure 20 Response Levels: Photographic and Observational
Data Combined

Node A. Node "A" stimulated a moderately high degree of visitor response. Pinus palustris and Quercus laevis were consensus photograph images also identified as interesting by interview subjects. In addition, many visitors were observed to pause in this area, read labels, and explore the display. Significantly, the presence of visually interesting display elements tended to increase visitor interest in story labels. The fact that this general area served as a visitor activity node may also be attributed to several other elements.

Visually, the area was a transition zone. It is probable, based upon landscape preference research (Kaplan and Kaplan, 1982; Ulrich, 1983), that a change in vegetation type (from Coastal Plain to Sandhill), topography, and plant form (from herbs and shrubs to mature trees) in this area had the collective effect of heightening visitor awareness. The power of such change in surroundings is well expressed by Simmonds (1961),

Man in motion takes great pleasure in the sensation of change—change of texture, light, quality, temperatures, scent, visual patterns, expanding or contracting views, and the fluid modulation of objects, spaces, and views.

Visitors passing into this area from the Coastal Plain section of the display experienced the stimulation of a novel and changing landscape.

Node B. The area around the ponds possessed several elements strongly attracting visitor interest. Water has long been known as an attractant of human interest in landscapes of all kinds (Ulrich, 1983). Predictably, NCBG visitors reacted with much interest to those areas around the ponds which allowed a close view of water and water plants. Indeed, Typha, Nymphaea, and Sagittaria were among the most popular of consensus photograph subjects. Many visitors would spend the majority of their habitat display visit gazing at pond plants and insect life.

Node "B" also bore several terrestrial plants drawing the interest of visitors. The fruits of Hibiscus (Figure 21) and a large Sarracenia were both photographed and examined many times. Significantly, a story label immediately adjacent to the pitcher plant was often read, bringing an additional dimension of visitor response. In interviews, visitors described these plants as unusual and interesting, suggesting that novelty was an important display quality drawing visitor interest. Kaplan and Kaplan (1982) and others have identified the novel, or unfamiliar, as source of landscape interest stimulating attention and curiosity.



Figure 21 Hibiscus coccinea

Node C. Node "C" hosted the most consistently active visitor behavior in the display. This node featured a sequence of perceptually stimulating scenes and details which may have exacted a collective effect on visitors. In addition to the allure of water and water plants, Node "C" contained the most widely read story labels in the display. The White Wicky (Kalmia cuneata) label elicited consistent visitor response with many subjects searching the landscape to find the described plant. This high level of perceptual interest was sustained as visitors moved away from the sign and came into close view of the ponds.

After passing by the pond, visitors encountered an element of mystery in the entrance to the Pocosin. Mystery is defined as the promise of additional information through forward movement, such as the view awaiting around a curve. Looking through the Pocosin entrance, the boardwalk disappears into darkness; a scene photographed by several visitors (Figure 22). Visitors tended to slow in their movement as they passed through this area, often seeming both apprehensive and curious. As Kaplan and Kaplan (1982) suggest, it is likely that the element of mystery serves to increase a visitor's sense of involvement with the landscape and hence their degree of



Figure 22 Mystery: Pocasin Entrance

preference for that landscape.

It (mystery) is an informational opportunity, and a gradual one at that. With the promise of more to think about, mystery provides the involvement component (necessary) for the longer range, future aspect of preference.

In support of the Kaplans' view, a significant number of visitors did express a liking for the Pocosin area.

Node D. The effect of floral color, though a powerful attractant throughout the display, was most evident in this node enclosing the most colorful area of the Pine Savannah. Visitor response consisted primarily of gazing at the masses of flowers, close examination of individual flowers, and much shared exploration and social interaction. The curiosity-stimulating effect of the plant identification booklet would often extend over to this area. Many of the visitors examining the booklet would double back to Node "D" of the Savannah to search for the flowers described in the booklet.

Node E. Node "E" combined the perceptual interest of water and water plants with the wooden bridge. The bridge served as a viewing platform used by visitors for gazing into the pond. Impatiens capensis and Ilex verticillata bore floral or fruit color, while the Sagittaria presented a bold and interesting leaf shape.

This plant life, surrounded by water, strongly attracted visitor attention.

Conclusions

Case study results revealed that the educational effectiveness of a habitat display depends upon stimulating behaviors of exploration, appreciation and learning in visitors. The success of habitat displays can perhaps be measured by their ability to induce these behaviors in a wide range of visitors.

In this regard, the NCBG habitat display's goal of imparting native plant awareness and appreciation was realized in the case of repeat visitors. Their familiarity with NCBG and/or the Coastal Plain plant communities proved to be a strong predictor of exploration and appreciation of the display. For many first-time visitors however, expectations of a more formal garden, and visit purposes other than "experiencing" a habitat simulation, obstructed their ability to grasp the display's message. These findings suggest that the design and interpretation of a habitat display must work to mitigate the first-time visitor's possibly negative response to the unexpected and unfamiliar habitat experience.

Display-related determinants of visitor response

were those display elements bearing strong perceptual interest and/or contributing to novelty and mystery. These elements proved capable of influencing visitor behavior regardless of an individual's familiarity with NCBG or other past experiences. The "attention-grabbing" effects of mystery, novelty, water, color and other elements suggest that landscape design strategies can be used to create habitat displays capable of reaching a broader range of visitors.

C

D

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CHAPTER 3

DESIGNING AND INTERPRETING HABITAT DISPLAYS: CONSIDERATIONS AND GUIDELINES

In order to design effective habitat displays, we must be aware of the many factors and complex interactions influencing visitor response to the display environment. Some of these factors, such as individual personality or societal values, are clearly beyond the control of the display designer. Other factors, however, such as planting design and interpretation can be controlled and are seen as critically important tools for enhancing display effectiveness. This chapter will discuss designing and interpreting the display environment in order to more successfully impart native plant information and appreciation to visitors.

Case study results demonstrated that the effectiveness of a habitat display depends upon its ability to stimulate behaviors of learning and appreciation in visitors. These behaviors take the form

of exploration and study of the display environment, reading signs, or simply lingering to "experience" the habitat. The challenge for habitat display designers is to create an environment that engenders these behaviors.

Because a habitat display approximates the appearance of a natural plant association, the designer is presented with a special set of considerations not dealt with in the creation of more traditional garden displays. In addition to meeting requirements common to all public gardens--orientation, amenities, maintenance, etc.-- the habitat designer must also succeed in connecting visitors with vegetation which is often perceived as "wild," "unkempt," and "overwhelming." Indeed the designer must prepare for visitors whose expectations are far removed from the thought of learning and exploring in a habitat display. As was evident at NCBG and as has been stated by Wise (1977), many people come to a garden to recreate, rather than read interpretive materials and learn. These people often arrive with a pre-determined agenda for their visit (Ransely, 1988) consisting of relaxing outdoors and enjoying the companionship of friends and family. Furthermore, many of the visitors who are coming specifically to learn about plants, are looking forward to roses, perennials and peonies; not Pocosin brush. For

these visitors, a Coastal Plain habitat may be a puzzling, unwelcome surprise. Yet by examining basic human response to natural environments, designers can succeed in making plant community displays palatable, interesting, and attractive to visitors.

Researchers in environmental psychology have devoted much attention to the nature of human reaction to different types of environments. Many have suggested that we react to built and natural environments in distinctly different ways. Kaplan and Kaplan (1982) discuss this dichotomy in terms of two different types of attention to environment: voluntary and involuntary attention.

Voluntary attention is characteristic of human experience in urban or built environments, and as most Americans live in cities, is most typical of our everyday lives. The hazards of urban living--automobiles, crime, general stress--force us to pay acute attention to our immediate surroundings. Because of the constant presence of hazards, such as those incurred while driving an automobile, we move through urban environments in a voluntary and stressful state of readiness. Though perhaps not acting on a highly conscious level, the urban environment demands we expend considerable effort maintaining a high level of vigilance in order to survive.

Conversely, involuntary attention characterizes our response to outdoor, non-built environments, particularly when we are engaged in leisure activities (Hammitt, 1982). Importantly, the concept of involuntary attention relates closely to visitor experience in a habitat display. Natural environments contain many elements that are inherently fascinating, novel, or aesthetically pleasing. As if a matter of natural reflex, our attention is attracted by water elements, flowers, animals, and changes in scale, enclosure, and other environmental elements. This type of attention is involuntary in that a state of alertness is maintained that requires no conscious, or voluntary effort. Hammitt states that involuntary attention is central to the pleasure we derive from experiencing natural environments through hiking, camping, and other wilderness activities:

The freedom to direct one's thoughts, attention, and use of time to what is fascinating is something a natural environment free of intrusions should foster. It is also an element characteristic of involuntary attention and should contribute to the cognitive state of tranquility. It is proposed that the natural environment promotes the freedom and cognitive control to concentrate on what humans find inherently fascinating and compatible with their information processing abilities. Tranquility and peace of mind results when this occurs.

Thus, the enjoyment of natural environments through involuntary attention is seen as an ingredient common to

many forms of outdoor recreation, including visits to public gardens.

Based upon the Kaplans' concepts, "getting away from it all" in an urban society means escaping the stress of the urban setting and its insistent demands on our attention. For respite, we often seek natural or naturalistic environments, like gardens, where involuntary attention is effortlessly focused on objects of intrinsic beauty and interest. In these environments, we take pleasure in exploring scenes and objects which are novel and interesting, often lingering to more fully appreciate nature's complexities.

Clearly, the act of paying involuntary attention to a natural environment parallels the behavior in which we wish habitat display visitors to engage. Indeed curiosity, an important component of positive visitor response, is frequently a byproduct of involuntary attention and an essential preliminary to exploration.

Curiosity is defined as a desire to learn or investigate a specific object or topic. Studies of museum exhibits (Koran, 1984) indicate that curiosity is necessary to attracting and holding visitor attention and contributes greatly to learning, discovery, interaction

with display elements, and other desirable outcomes. Therefore, stimulating curiosity is an important objective in habitat display design; once we have succeeded in drawing visitors' involuntary attention to a display element, we must then, by further piquing their curiosity, encourage additional exploration.

In sum, designing to direct involuntary attention and stimulate curiosity is proposed as a strategy for reaching the visitors who present the biggest challenge for the habitat designer; those who arrive seeking respite and general recreation in a stylistically formal and conventionally "pretty" garden environment. As was seen at NCBG, these expectations can prevent visitors from fully experiencing a habitat display. However, by using design elements to direct the involuntary attention of visitors to targeted habitat images, we can perhaps work to mitigate those preferences and visit agendas not conducive to interaction with a habitat display. Though many visitors may not have come to experience a habitat recreation, they may respond affirmatively to a display designed to focus their attention (involuntary) on habitat elements rich in perceptual interest. Most importantly, this strategy can accomplish the educational goals of our exhibits while also enhancing the recreational experience

of our visitors.

How can we carry out this strategy of designing and interpreting a habitat display to focus involuntary attention and stimulate curiosity, exploration, and learning in visitors? To consistently elicit these behaviors in our visitors requires design and interpretive elements capable of speaking to a broad spectrum of people, regardless of their background, or visit expectations. Thus, the following recommendations for habitat display design and interpretation have been chosen because of their universal power to influence human behavior, and hence draw attention to the essential elements of a plant community. They are derived from the NCBG study results and the current literature in landscape preference, environmental psychology and exhibit design.

Finally, and perhaps most importantly, these recommendations are made in hopes of reaching visitors similar to the "Uncomprehending and Disinterested" category encountered at NCBG. One very important fact mandates this focus: such unreceptive visitors are often unaware of conservation messages and are, in many ways, the people environmental institutions most want to reach.

Recommendations shall fall into two categories:

1) Interpretation and, 2) Landscape Design.

Interpretation

Interpretation is defined as the use of on-site materials or elements to enhance visitor appreciation and understanding of display elements. Interpretation is a broad and complex field whose basic principles and methods are key to the success of native plant habitat displays. Based upon observations at NCBG, recommendations shall focus on those interpretive principles and methods felt to be especially relevant to habitat exhibits.

Conceptual Orientation

Conceptual orientation communicates to visitors the broader themes, purposes and organization of an institution and its exhibits (Hayward, 1988). As evident in the NCBG study, and has been well stated in the literature (Wilbur, 1977), the need for conceptual orientation is particularly acute for first-time visitors. As one of the primary goals of native plant exhibits is to impart appreciation to new, perhaps uninformed visitors, providing effective conceptual orientation is a critical concern.

In fact, the degree to which we succeed in orienting new visitors to display themes may have a direct

bearing on their appreciation and learning (Ransely, 1988). Maw (1983) states that providing "cognitive bridges" between visitors and exhibit elements is a powerful stimulant of curiosity, leading to exploration and interaction with display elements. To fully understand conceptual orientation and its value to visitor experience, we must examine the means by which visitors make their way through a new environment and endeavor to understand it.

Many cognitive theorists (Kaplan and Kaplan, 1982) contend that our ability to make sense of a new environment is dependent on the presence of cognitive structures through which we can decipher and code perceptual data. In the case of guiding first-time visitors through a garden environment, this theory requires that we first provide them with a cognitive structure which previews the experience awaiting them. This structure enables visitors to make sense of display elements by placing them within the context of an existing information framework--provided by orientation. Therefore, effective orientation may be seen as constructing a "cognitive map" in the visitor's mind, capable of lending shape and meaning to their experience. Such a map includes an overview of the site's

organization, options for circulation through it, and particularly in the case of habitat displays, an introduction to the display's concept, message and purpose.

The need for conceptual orientation in the garden is accentuated in unexpected and unfamiliar settings, such as native plant habitat displays. This fact is powerfully validated by the disappointment and frustration of some first-time NCBG visitors arriving with expectations of colorful, formal gardens. Because of a lack of orientation explaining the habitat's meaning, these visitors had no cognitive structure with which to make sense of the display. Orientation for habitat displays must combat negative reactions to the unexpected and unfamiliar by reshaping expectations, serving as a key to understanding and appreciation.

Orientation should make clear not only the educational purpose of a habitat display but also its relationship to the larger purpose of an institution. Certainly visitors understanding NCBG's commitment to environmental education and its many conservation activities might have more clearly understood the habitat display's meaning. Importantly, effective orientation can work to explain how a habitat display relates to a larger

message as well as to the other displays and activities of a garden.

The many tools and actual mechanics of garden orientation is a large topic beyond the scope of this thesis. However, as summarized by Ransley (1988), hand-held materials, information boards, off-site promotion, and other methods may all succeed in acquainting visitors with a habitat display's basic concepts and themes.

Story Labels

Once conceptual orientation has succeeded in introducing visitors to the overall habitat concept, story labels can amplify parts of a larger message, interpret important elements of the display, or work to advance the "story line" of a display (i.e., the importance of water to the Coastal Plain). Story labels are signs providing text and illustrations relating to specific locations and elements within a display. They are invaluable tools for accomplishing display goals, conferring importance and meaning to elements that would otherwise be overlooked.

The potential value of story labels to habitat displays is underscored by a recent nature trail study. Hammitt (1987) studied a group of hikers, assessing their ability to recall specific scenes experienced during their

hike. He discovered that interpretive signs not only increased the ability of visitors to recognize specific forest scenes, but also their degree of preference for those scenes:

It appears that the signs are serving to capture the hiker's attention at certain locations along the trail; they in turn stop to read and ponder the interpretive message. This behavior causes prolonged contact or focus on the immediate environment, and thus increases their visual involvement and familiarity for the scene at the location. Increased involvement should be a factor in enhancing visual recognition for an environment.

Story labels, in addition to conveying specific information, also serve to encourage visitors to focus on the surrounding landscape. As habitat displays strive to instill familiarity with native floras, story labels offer an effective means of making habitat images more memorable. Story label placement should be seen as a useful tool for highlighting the essential elements and areas of a display. Showcasing the key visual characters of a plant community by combining representative plants with a label or other interpretive materials is an obvious and proven application (NCBG study data).

Toward the goal of instilling familiarity with native flora, story labels are best used to encourage visitors to feel a sense of personal involvement with a habitat landscape. Kaplan and Kaplan (1982) have

described a sense of involvement as a key ingredient of the process by which human beings explore and become familiar with novel environments. Selecting appropriate label content and theme can strengthen the dimension of personal involvement between visitor and habitat, and consequently confer greater familiarity with a heretofore unknown environment.

Regarding the role of personal involvement, Freeman Tilden, in his landmark book, Interpreting Our Heritage (1967), states "Any interpretation that does not somehow relate what is being displayed or described to something within the personality and experience of the visitor will be sterile." At NCBG, visitors who were able to relate display contents to personal knowledge and experience were able to identify with the plants more strongly. Consequently, they were also able to better appreciate the display, experiencing a greater sense of involvement. Relating display contents to subjects of common interest, such as state and local history, wildlife, Native American cultures, food, medicine or cooking, places a personal value on native plants. This approach uses existing cognitive structures in which visitors can place the unfamiliar plants and habitat environment, thereby making the most of what little

familiar, pre-existing knowledge they may be able to relate to the display.

Story labels, and all other interpretive materials, should work together to convey a few broad and important messages and themes. Rather than concentrate on details and facts, labels should use interesting habitat elements to give life to larger issues such as ecosystem fragility, the urgent need for conservation, and solutions to environmental problems. Many of the visitors at NCBG were totally unfamiliar with ecology and biological communities; two basic concepts critical to fully understanding the display. For such visitors to not only learn these concepts but also specific details is probably too much to expect from their 5 to 10 minute walk through a habitat display.

Story labels can effectively work together to repeatedly reinforce these important messages. The "story line" approach can succeed in lending structure and sequence to broad interpretive messages. Studies of museum exhibits have documented that information placed in a story line structure is of greater interest to visitors than that of a more fragmented presentation (Washburne and Wagar, 1972). Important issues specific to a displayed plant community, such as the importance of fire to

Prairies, can thus be woven throughout the visitor's experience, ensuring maximum understanding and retention.

In addition, effective interpretive materials will be able to anticipate and answer the questions of visitors as they view various elements of a habitat. In anticipating visitor questions, we should assume that the visitor is unfamiliar with the display's themes, as first-time visitors may be a story label's primary audience (NCBG study). Satisfying aroused curiosity in these visitors is a powerful means of instilling knowledge and stimulating further inquiry (Kaplan and Kaplan, 1982). Providing story labels which explain an interesting word, unfamiliar object, the unexpected, strange, or beautiful, will make both habitat images and relevant information more memorable (casually surveying visitors will identify key questions). The power of this approach to fully utilize the visitor's pre-existing cognitive structures is well described by the Kaplans:

Perhaps more than anything else, the sort of information people will be most eager to get and most attentive to is the information that answers their questions. Answering questions greatly increases the likelihood that one is relating material to pre-existing cognitive structures.

Story labels which pose appropriate questions to the visitor are similarly effective. Visitors in informal

learning environments often enjoy the challenge of answering questions and the feeling of accomplishment that comes with mastering new information (Wilbur, 1988). Signs asking visitors, for instance, why a plant is growing in a particular spot or why certain animals live in association with it, pique curiosity and increase the visitor's sense of involvement with the display.

Finally, story labels must encourage visitors to interact with the plants and rich life of a habitat display. The conventional wisdom of exhibit design and interpretation suggests that visitors best recall experiences of personal involvement and action which stimulated as many of the senses as possible. Peart (1984) describes visitor interaction with an exhibit as "any movement associated with gaining better comprehension with an exhibit - stepping closer, touching, discussion, and use of the senses". In evaluations at the British Columbia Provincial Museum, Peart found a positive correlation between interactive behavior, knowledge gain, and attitudinal change. Habitat interactions such as those, observed at NCBG can be encouraged by signs pointing out the waxy fruit of a viburnum, the rich texture of grass seed heads, or the fragrance of flowers. Exploration of a habitat display is largely a matter of interaction, and

story labels can make visitors aware of the pleasures to be gained by "touching" the life of the display.

Plant Identification

Learning the names of plants is a strong interest for many public garden visitors. Price (1986) and others have documented the consistency with which visitors seek out identification labels, read them aloud, and use their mastery of plant names as a measure of accomplishment.

Providing for plant identification in a habitat display presents a special challenge. Because of the density and diversity of many plant communities, label placement and maintenance becomes critical. At NCBG, many visitors were frustrated by the difficulty of discerning which plant went with which label. Also, many visitors were discouraged by the lack of labels for all or most of the blooming plants. Though a labor intensive activity, new labels must be added and others removed as plants go in and out of bloom, or some plants overgrow others.

Effective plant identification signage for habitat displays must be able to swiftly and accurately respond to seasonal changes. As seen in the behavior of NCBG visitors, and as would be expected of visitors to most other gardens, blooming plants are the primary source

of identification interest. Color signs depicting "What's in bloom this month" would be an expensive, but effective alternative to the standard black and white identification label common to public gardens.

In using this strategy to increase visitor involvement with the display, it is important to make plant identification a pleasurable activity. During observation studies, NCBG visitors were often overheard to read identification labels aloud or to share with one another their knowledge of plant names. Evident in this behavior was the pleasure and pride people take in demonstrating their knowledge and the sense of accomplishment that comes with mastering new information. Toward this end, identification materials should make learning an accessible, "doable" and fun task. Efforts to facilitate plant identification should perhaps focus on just the five or six most prominent flowering plants, providing visitors with an opportunity for mastery. Also, more accessible identification materials would make the experience of learning available and appealing to a larger number of visitors. It is reasonable to assume that visually striking, easily read, and even manipulable identification materials (such as the small, revolving color panels commonly used in zoos) would encourage

visitors not normally interested in plant identification to look for specific plants in the display.

Finally, guarding against the overuse of signs and other interpretive materials is essential to an effective habitat display environment. As discussed, many visitors arrive at a public garden in hopes of escaping the stress and demands of the urban environment. Certainly the abundance of signs and symbols saturating our cities is an unwelcome element in a garden, and one that is discordant with any plant community image. Therefore, in our zeal to impart knowledge, we must take care not to compromise the restive and aesthetic aspects of the habitat display experience, nor the essential visual qualities of the habitat depicted. It is critical that we distill the essence of what we wish to say to visitors, and use interpretive materials judiciously and sparingly to empower that message.

Landscape Design

The NCBG case study* demonstrated the power of certain landscape elements to influence visitor behavior. Perceptually exciting nodes bearing rich perceptual detail provoked learning, exploring, and time-spending in visitors. Thus, in creating habitat displays, perceptual

detail is seen as a useful design tool for effectively directing the involuntary attention and curiosity of visitors.

Moreover, creating habitat scenes of high perceptual interest makes plant community images and characteristics more memorable for visitors. Studies of recreational experience in natural environments indicate that the more perceptually exciting we find a scene, the more interesting we find it (Cherem and Driver, 1983), and the more likely we are to remember it (Hammitt, 1987). Thus, the perceptual excitement generated by a landscape may have a direct bearing on the visitor's ability to later recognize that landscape; a critical consideration in the design of displays attempting to impart familiarity with the visual character of native floras.

Other landscape design strategies for enriching the habitat experience include landscape immersion and habitat abstraction techniques. These strategies, along with the design of perceptual nodes, can be used to enhance visitor appreciation and learning in habitat displays.

Design Strategies

Before describing design strategies, it is

important to emphasize that a habitat display is intended, first and foremost, to portray the visual character of a regional or local flora. In this respect, habitat displays are not ornamental in purpose. Rather, they strive to recreate the appearance of plant associations based on natural models. Aesthetic criteria are often secondary to overall accuracy in their design. However, as in the design of animal habitat exhibits in zoos, there are many alternative approaches in representing a plant community's visual character to the public.

Given that it is impossible to accurately replicate a plant community in every botanical detail and ecological subtlety, any habitat display is, by definition, a simulation rather than a duplication. Habitat displays simulate to varying degrees, the actual content and arrangement of the plant community depicted. The specific design philosophy of a habitat simulation may be determined by one of several priorities. If scientific accuracy is a central consideration, then the habitat display may take the form of an ecological restoration and attempt to simulate the actual species composition and structure of a plant community. At the opposite extreme, if imparting appreciation and knowledge to the visiting public is a primary goal, then the display may take the

form of a more abstracted, and perhaps more memorable and interesting, representation of the community.

Recognizing the urgency of habitat preservation issues, the design of an educational habitat display must ensure positive impact on visitors; a priority equal to or greater than pursuing absolute scientific accuracy. Yes, abstracted habitats might very well be inaccurate in terms of species distribution, herb layer and other details important to the scientific community. Yet, in terms of overall form, texture, color and other qualities evident to the average visitor, the abstracted display can accurately simulate the visual character of a plant community. Moreover, by emphasizing the more novel and aesthetically pleasing elements of a community we can provide more exciting and memorable experiences for visitors. Assuming our primary goal is to impart visual familiarity with the plant community, this approach is a viable and desirable alternative to the painstakingly detailed, often visually confusing ecological restoration.

Polakowski in his excellent book, Zoo Design: The Reality of Wild Illusions (1987), describes the special requirements of this approach in the design of zoo habitat exhibits:

They (habitat exhibits) must seek the essence of

the landscape to be replicated and must, therefore, be an abstraction of that landscape. It is critical that the sense of space in the exhibit and the form and character of plant masses and topography are true to the environment being simulated.

In agreement with this view, fidelity to "sense of space" and the "form and character of plant masses and topography" is the basic and constant tenet of habitat display design. The following design strategies abstract a plant community's visual qualities in order to focus the attention of visitors. But it is to be assumed that these abstractions are invariably made in keeping with a plant community's unique and essential character.

Designing Perceptual Nodes

The creation of perceptually exciting nodes involves utilizing the many visual elements which contribute to perceptual excitement. Research in landscape preference (Ulrich, 1983) has identified many landscape qualities capable of capturing human interest in natural settings. Novelty, mystery, water, depth, focality, structure, and complexity will therefore be discussed as elements which comprise the "inherently fascinating" in a garden environment. As such, they are recommended as design tools for generating perceptual excitement and drawing the involuntary attention of habitat display

visitors.

All plant communities possess, to varying degrees, these visual elements of perceptual excitement. Deciding which of these elements is to be used, or emphasized, and how it can be combined with others is dictated by the requirements of the site, the visual qualities of the plant community being depicted, the educational goals of the display, and the artistic ability of the designer. Therefore, the general ingredients of perceptual excitement are described here, with the actual recipe for their use to be determined on a case-specific basis. Also, it is important to note that these factors have an interactive effect on visitor behavior. In working with the design of PENS, we must not consider these various factors in isolation, but rather their collective impact on the visitor.

Before proceeding to describe these factors, some mention should be made of the more traditional elements of landscape design: color, line, texture, form, and other visual qualities. Many plant communities are characterized by their unique textures, shades of green, and spatial volumes. Indeed, any habitat designer must carefully study natural models in order to faithfully replicate appropriate colors, textures, and forms. Also,

these elements can be used to create mystery, novelty and other gross landscape effects about to be discussed. However, they are seen as the basic building blocks of design and the reader is directed to introductory design texts for the principles of their use.

Novelty. The design of a habitat display must acknowledge that the display exists along a continuum of visual experience within the garden and beyond. Human beings move through a multitude of different environments, and their reaction to any one setting is at least partly determined by the qualities of the environments which preceded it (Gustke and Hodgson, 1980). In the case of a habitat display, visitors may have visited other more formal and colorful areas of the garden first, or may just be emerging from their cars or an urban environment. In any case, upon entering the habitat display, the first-time visitor is confronted by a novel and unfamiliar scene. Initially, the wealth of unfamiliar stimuli generates a high level of perceptual interest, effectively directing the involuntary attention of the visitor and provoking curiosity. However, unless new and interesting stimuli continue to be encountered, visitor interest quickly subsides and pace of movement through the display steadily accelerates as the search for novel perceptual

interest begins anew.

Novelty, therefore, is defined as the stimulating effect of new and interesting stimuli in the landscape. Providing novel stimuli serves the basic human need to discover and make sense of new surroundings (Kaplan and Kaplan, 1982). In many ways, the value of other factors yet to be described (complexity, structure, depth, etc.) is that they can all be used as members of the subset which comprises novelty. These factors generate the perceptual interest and visual distinctions that differentiate one landscape from another, creating novelty capable of provoking curiosity and exploration in visitors.

Gutstke and Hodgson (1980) describe the occurrence of novelty along a nature trail as episodes of discontinuity along an otherwise visually continuous route. Their studies of trail hikers demonstrated that visitors movement slows and interest peaks in areas of discontinuity or at the edges between different kinds of environments. Of their observations, they hypothesize:

...knowledge of the relationship between discontinuity and the experience of pleasure can, perhaps, improve interpretive communication....Relevant messages received at points along the trail where aesthetic pleasure peaks should be more easily learned and better retained than messages received elsewhere along

the trail. Thus interpreters might improve their communications by selecting points immediately after discontinuities to present their most important concepts and principles.

As suggested by Gutske and Hodgson, areas of novelty may be used to hammer home interpretive messages, presenting visual elements representative of a plant community's character and other targeted images.

In this regard, it is important to note that the frequency of discontinuities along a route influences the impact of visual novelty on the visitor. Episodes of visual discontinuity occurring at too high a frequency may habituate the visitor to constant novelty and induce fatigue, thereby numbing the desired response. Richly mixing a range of striking detail elements to create novelty (color, scale, texture contrasts, etc.) may partially mitigate this saturation effect, sustaining the visitor's interest in seeking additional novel stimuli, or exploring, in a habitat. The kinds of gross visual qualities which may be used to create novelty will now be described.

Mystery. The foundations of the power of mystery in the garden may be found in our inherent need to seek information about new environments. Under primitive conditions, our survival depended upon our ability to

explore a new territory and identify both its resources and hazards (Kaplan and Kaplan 1982). As a reflection of this need for environmental knowledge (and as demonstrated by visitor response to the NCBG Pocosin habitat), we tend to respond with great curiosity and interest to landscape scenes which disappear into darkness or possess paths with curving sight lines. These elements promise information gain and new images as we move forward and penetrate into the unknown terrain of a display landscape.

In terms of kinds of landscape features, the promise of additional information may be conveyed through the use of deflected vistas (Ulrich, 1983). A curving path, such as that leading into NCBG's Pocosin, creates a sense of mystery as visitors anticipate that which cannot be seen from their angle of approach. As visitors pass from one space of a display to another, the design should maximize anticipation and drama by presenting a sequence of gradually more revealing approach views. The resulting anticipation experienced by visitors heightens awareness of the display environment, creating perceptual excitement and focusing involuntary attention. To ensure a novel and exciting experience for visitors, any habitat display should incorporate mystery as a prime design ingredient.

Water. The influence of water on the behavior of

NCBG visitors was an easily predicted reaction that is well described in the literature of garden design, environmental psychology, recreational science and related fields. Water is among the most powerful of landscape elements, capable of eliciting interest, aesthetic appreciation, and feelings of tranquility (Hubbard and Kimball, 1967). NCBG visitor behavior around habitat water features was characterized by high levels of perceptual excitement, time spending, and interactions with surrounding non-water related elements.

For purposes of habitat display design, water is perhaps best used as the "trump card" of behavioral determinants. Areas around water features offer exceptional opportunities for communicating interpretive messages not to be squandered. If the natural characteristics of the plant community being exhibited allow only one water element, designers and interpreters should capitalize on it as a perceptual excitement bonanza. Such areas, where visitors are the most likely to be spending time, are natural staging areas for interpretive materials and the targeted images of a flora.

Depth. Studies of various kinds of natural vegetation have found that people exhibit a well pronounced preference for scenes offering visual depth

(Ulrich, 1983). This characteristic is defined as the degree to which we can see into a landscape scene. Described in common parlance as "openness" or "spaciousness", visual depth may be a strong predictor of positive visitor response to habitat displays.

For purposes of designing plant community representations, is it important to note that depth is not an inherent visual characteristic of some vegetation types. Designing Chaparral displays, for instance, may be particularly difficult due to their natural visual impenetrability. Designers of such displays should be aware of our natural preference for openness and perhaps stylize their representations to allow some depth. In general, visual depth in the landscape should be recognized as a source of perceptual interest and an important opportunity to direct the attention of visitors.

Focalilty. The concept of focalilty describes the degree to which a landscape possesses a clear focal point, area, or element which immediately attracts visitor attention. At NCBG, colorful flowers, story labels, unusually textured or shaped plants (pitcher plants), insects and water all functioned as focal points in various scenes.

Some research indicates that we tend to prefer landscape scenes with definite focal points (Ulrich, 1983). In the micro-design of "vignettes" within a habitat display, designers should consider elements characteristic of the plant community portrayed, and utilize them as focal points. Such considerations should encompass seasonal changes and how the visitor's attention to focal points will shift throughout the year. The degree to which a targeted element is centered in the landscape is best thought of as another stylization option to be made in accordance with the depicted plant community's natural visual character.

Complexity. Complexity denotes the number of independently perceived elements in a landscape. The NCBG Pine Savannah is an example of a landscape of extremely high complexity. It was composed of a diverse array of independently perceived elements--Solidagos, Eupatoriums, Asters, grasses and charred stumps--distinguished by variations in color, height, texture, and distribution. In contrast, the Sandhill area was of extremely low complexity, bearing only sand and a few scattered grasses and composites as independent elements.

Landscape preference theory suggests an inverted U-shaped relationship between complexity and preference

(Berlyne, 1971). The U curve predicts that we would have a preference for scenes of moderate complexity and disdain for those of extremely high or low complexity. This tendency was borne out in the behavior of many NCBG visitors, as they consistently described the Sandhill area as "barren" and "boring" while referring to the Pine Savannah as "overwhelming" and "wild" ("I can't tell one plant from another").

The design of habitat displays should respond to the complexity level of the plant community being depicted. To ensure positive visitor response, plant communities which inherently bear extreme lows or highs in complexity may require stylization. Simplification by reducing the number of elements or increasing structure (see below) mitigates high complexity levels. Conversely, embellishing with other design elements (structure, color, depth, etc.) can lend complexity to an otherwise "barren" scene. Also, sharp gradations in complexity may be used to create novelty and hence perceptual excitement in specific areas of a display.

Structure. All vegetation types possess a typical gross structure or order usually defined by a ground plane, shrub layer and, in some cases, tree layer. The visual cohesiveness of this structure is affected by the

number of homogeneous elements which can work together to form a well-pronounced visual pattern. The strength of such patterns is usually a function of species composition, occurrence patterns, density and other plant community characteristics. Ulrich (1983) suggests that the clearer and stronger the visual structure, or pattern of a landscape, the higher the degree of human preference for that landscape. He theorizes that a clear overlaying structure provides the visitor with a visual framework enabling quicker and more efficient assimilation of environmental stimuli.

In a highly complex, relatively unstructured landscape, such as a savannah or chaparral, imposing structure in the form of repeating elements, combining of homogeneous colors and textures, or other forms of visual continuity would make a landscape appearing "wild" and "overgrown" to some visitors, perhaps less threatening. Such modifications of overall structure in habitat design, may enable visitors to appreciate seemingly chaotic plant communities. Clearly implicit in this strategy is the assumption that "domesticating", or simplifying, the appearance of some vegetation types by structural stylization is permissible, assuming that connecting with visitors is the overriding goal.

Landscape Immersion

Landscape Immersion is a zoo exhibit design technique which "immerses" the visitor in a recreation of the displayed animal's natural habitat. The technique uses carefully designed landscapes and meticulously controlled viewing angles to erode exhibit barriers, creating for visitors the illusion of cohabitating an animal's environment. First articulated by designer Grant Jones (Jones, Coe, and Paulson, 1976), this approach has found great favor because of its ability to convey to visitors the critical relationships between animal and environment. Implicit in landscape immersion exhibits is the ecological importance of the habitat environment, and the fact that all organisms demand and deserve a special "home" to survive. As native plant habitat displays seek to demonstrate the same kinds of ecological relationships, the technique suggests a valuable new direction for plant habitat design.

As summarized by Jones, the technique relies upon making the visitor feel part of a realistic recreation of the displayed organism's habitat:

The success of this landscape immersion technique depends entirely upon two factors: 1) the completeness and correctness with which the

characteristic landscape is projected, and 2) the care and accuracy with which the viewpoints and views are located and composed, concealing barriers, enhancing perspectives, composing light and shadow, and most importantly, visually unifying animal space and visitors space.

Translating this approach to the display of a plant community pivots on making visitors feel a part of a realistic wild plant habitat. Poorly stylized habitat landscapes, appearing contrived or "phony," may repel visitors and conjure up images of miniature golf courses rather than targeted plant communities. Thus, the basic challenge for designers is to use landscape effects to create the illusion of realism in the habitat display environment. The following design elements are recommended toward achieving this end.

- 1) The perceived size of the display can be expanded through eliminating boundary elements (borrowed scenery) extraneous to the habitat and providing strong internal views and focal points to habitat elements.
- 2) Each habitat scene should be presented from a number of different viewpoints, emphasizing different habitat qualities, and again, increasing the display's perceived size and spatial interest.
- 3) Path design and materials should be naturalistic, conforming to the topography, colors, and ground textures

of the displayed habitat.

4) Interpretive structures should be made of materials found in the habitat or at least similar in color and texture.

5) To sequentially orchestrate the experience of visitors, path options should be minimized and the direction of visitor movement controlled. Path layout should direct visitors to critical views, images, and interpretive materials. Such areas should be treated as special destinations, with ample space and, where appropriate, seating to encourage visitors to linger.

6) Water features should be presented as organic features of the landscape with a clear and logical source.

7) Amenities such as comfortable seating, water fountains, shady areas for resting, should be provided to encourage time-spending in a display. A few moments of quiet rest in a habitat may enable visitors to observe the more subtle qualities of a plant community.

8) In order to maximize involvement with immediate surroundings, habitat displays should, if at all possible, offer multi-sensory experiences. Providing environmental sounds with water features or bird habitat strengthens a display's sense of place. Easy opportunities to touch or handle flowers, leaves, barks, water and other habitat elements should be provided. Path materials should convey

the tactile sensation of walking through the actual habitat (i.e., sand for a dune or leaf litter for a forest floor).

Crafting the Habitat Illusion

In sum, the successful habitat display is a landscape abstracted and stylized to create the illusion of actual habitat images and experiences, and convey the visual essence of a flora. As stated by Polakowski (1987), the artful creation of illusions is perhaps the habitat designer's most powerful tool:

The designer should not be too concerned about clearly understanding the distinction between reality and illusion that involves the blurred interface of conscious and subconscious regions of the mind. Illusions can be catalysts for the creation of superb designs. We should admit to the existence of illusions, enjoy the visual puns that the mind and the eye create, understand their value, and consider their role and application ...They not only create a sense of enjoyment but they can help sustain our search for knowledge and the key to reality.

The foregoing discussion has not intended to present a set formula for successful habitat display design. Rather, it has touched upon only a few of the many subtle visual clues which can create perceptual excitement, invoking the visitor's creative instincts and imagination to complete the habitat experience. The public's willingness to experience and enjoy illusions is evident

in the fervor with which they embrace the latest attractions at Disneyworld, and habitat simulations at zoos and aquaria. The success of future habitat garden exhibits may depend upon their ability to generate a similar sense of wonder and excitement.

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* APPENDIX 1

Mail survey completed by gardens displaying native plants
in habitat displays

A NATIONAL SURVEY OF NATIVE PLANT DISPLAY OBJECTIVES AND METHODS

Please note this working definition: A native plant display is a public garden exhibit containing cultivated (deliberately planted) plants indigenous to the U.S., presented for the edification of visitors.

Please use the backs of these pages as extra space for responses and comments.

1. When did your institution first open to the public?

- | | |
|---|---|
| <input type="checkbox"/> 1 to 5 years ago | <input type="checkbox"/> 30 to 40 years ago |
| <input type="checkbox"/> 5 to 10 years ago | <input type="checkbox"/> 40 to 50 years ago |
| <input type="checkbox"/> 10 to 20 years ago | <input type="checkbox"/> 50 or more years ago |
| <input type="checkbox"/> 20 to 30 years ago | |

2. When did your gardens first exhibit cultivated native plants?

- | | |
|---|---|
| <input type="checkbox"/> 1 to 5 years ago | <input type="checkbox"/> 30 to 40 years ago |
| <input type="checkbox"/> 5 to 10 years ago | <input type="checkbox"/> 40 to 50 years ago |
| <input type="checkbox"/> 10 to 20 years ago | <input type="checkbox"/> 50 or more years ago |
| <input type="checkbox"/> 20 to 30 years ago | |

3. When was your most recent public native plant display initiated?

- | | |
|---|---|
| <input type="checkbox"/> 1 to 5 years ago | <input type="checkbox"/> 30 to 40 years ago |
| <input type="checkbox"/> 5 to 10 years ago | <input type="checkbox"/> 40 to 50 years ago |
| <input type="checkbox"/> 10 to 20 years ago | <input type="checkbox"/> 50 or more years ago |
| <input type="checkbox"/> 20 to 30 years ago | |

4. Which of the following best describes your institution's form of governance?

- ☐ Part of a university or other educational institution
- ☐ Private, non-profit organization
- ☐ Facility managed by governmental agency
- ☐ Other (please describe)

5. Which of the following best describes your institution?
(check all that apply)

- | | |
|--|--|
| <input type="checkbox"/> Arboretum | <input type="checkbox"/> Nature Center |
| <input type="checkbox"/> Botanical Garden | <input type="checkbox"/> Park |
| <input type="checkbox"/> Historic Site | <input type="checkbox"/> Display Garden |
| <input type="checkbox"/> Community Garden Center | <input type="checkbox"/> Research Center |
| <input type="checkbox"/> Other (please describe) | <input type="checkbox"/> Museum |

6. What is the yearly visitation to your institution?

- | | |
|---|--|
| <input type="checkbox"/> Less than 5,000 | <input type="checkbox"/> 50,000 to 75,000 |
| <input type="checkbox"/> 5,000 to 10,000 | <input type="checkbox"/> 75,000 to 100,000 |
| <input type="checkbox"/> 10,000 to 30,000 | <input type="checkbox"/> 100,000 or more |
| <input type="checkbox"/> 30,000 to 50,000 | |

7. To view your garden, a visitor must: (check all that apply)

- ☐ Pay an admission fee
- ☐ Make an appointment
- ☐ Be accompanied by a guide
- ☐ Belong to a membership organization
- ☐ None of the above

8. Approximately what percentage of your institution's total public garden area is devoted to cultivated displays of native plants?

- ☐ 0 to 5%
- ☐ 5 to 10%
- ☐ 10 to 25%
- ☐ 25 to 50%
- ☐ 50 to 75%
- ☐ 75% or more

9. Approximately how many acres do you cultivate in native plant garden area?

- | | |
|---|--|
| <input type="checkbox"/> 1 to 3 acres | <input type="checkbox"/> 50 to 75 acres |
| <input type="checkbox"/> 3 to 10 acres | <input type="checkbox"/> 75 to 100 acres |
| <input type="checkbox"/> 10 to 25 acres | <input type="checkbox"/> 100 or more acres |
| <input type="checkbox"/> 25 to 50 acres | |

10. Does your institution have public areas bearing uncultivated, native vegetation?

☐ Yes ☐ No

10a. If yes, please estimate the percentage of public area at your institution bearing uncultivated native vegetation.

- ☐ 0 to 5%
- ☐ 5 to 10%
- ☐ 10 to 25%
- ☐ 25 to 50%
- ☐ 50 to 75%
- ☐ 75% or more

11. How would you describe your native plant displays as attractions drawing visitors to your institution?

- ☐ Primary attraction when in peak bloom
- ☐ Primary attraction year-round
- ☐ Secondary attraction, important to a few visitors
- ☐ Minor attraction, relatively unimportant
- ☐ Other (Please explain)

12. How would you group your visitors in the following categories?
Please assign an approximate percentage to each category.
(answers should total 100%)

☐ Tourists visiting from other areas
☐ First-time visitors from the local community
☐ Repeat visitors from the local community

- 12a. Similarly, use approximate percentages to group your visitors in these categories. (answers should total 100%)

☐ School children and other students
☐ Amateur horticulturists and home gardeners
☐ Professional horticulturists and plantspeople
☐ Visitors seeking relaxation and recreation, rather than education
☐ Other (please describe)

13. How would you describe the ratio of woody native taxa to herbaceous native taxa displayed in your garden,
in terms of total numbers in each group?

☐ Slightly more herbaceous taxa
☐ Significantly more herbaceous taxa
☐ Roughly equal numbers of woody and herbaceous taxa
☐ Significantly more woody taxa
☐ Slightly more woody taxa

14. How would you describe the ratio of native woody plantings to native herbaceous plantings in terms of total garden area occupied by each?

☐ Slightly more herbaceous garden area
☐ Significantly more herbaceous garden area
☐ Roughly equal amounts of woody and herbaceous garden area
☐ Significantly more woody garden area
☐ Slightly more woody garden area

15. What percentage of the native plant display area in your garden has been designed in the following ways?
(Please make sure your answers total 100%)

☐ Displays designed through a team effort involving two or more staff members
☐ Displays designed by a single specialist on the garden staff
☐ Displays designed by outside specialists
☐ Other (please describe)

16. Please list the titles of those individuals responsible for display design and the siting of native plants in your garden.

17. In order of priority in your garden's native plant work, please number the following (1 = most important, 6 = least important, leave blank if not applicable).

- ☐ Scientific research pertinent to native plants
- ☐ Native plant selection and breeding
- ☐ Promotion of natives as landscape plants
- ☐ Educating the public about the importance of plant conservation
- ☐ Presenting aesthetically pleasing garden displays
- ☐ Presenting and interpreting natural history
- ☐ Other (please describe)

18. What specific plant associations do you presently attempt to exhibit in your garden displays?

Use the classifications and terms that you use in your interpretive literature and other tools for educating your visitors. Include specific associations such as Foothill Sage scrub or Coastal Terrace grassland, as well as more general associations, such as Alpine or Piedmont.

19. According to current plans, what other plant associations will be added to your displays within the next five years?

20. Which of the following best describes the types of native plant displays in your garden? Please indicate different types of displays by checking two or more responses.

- ☐ Habitat displays simulating the appearance of native plant communities
- ☐ Ecological restorations attempting to reconstruct plant communities
- ☐ Landscape displays demonstrating the value of native plants as garden ornamentals
- ☐ Collections presenting plants which come from specific geographic regions or belong to particular taxonomic groups
- ☐ Ethnobotanic displays which focus on Native American plant use
- ☐ Other; please describe

21. Does your institution have at least one full-time employee with academic training or special knowledge pertaining to native plants?

___ Yes

___ No

22. Does your institution have at least one full-time employee with academic training or special knowledge pertaining to education and/or interpretation?

___ Yes

___ No

23. Which of the following do you regularly use in your garden to help your visitors understand and appreciate your native plant displays and collections? (please check all that apply)

- ___ I.D. labels for most of your plants
___ Information pamphlets
___ Information panels and/or interpretive signs
___ Garden tour guides
___ Other (please describe)

24. Which of the following facilities and/or programs does your institution have?

- ___ Information center
___ Classroom/lecture facilities
___ Periodic publication which includes native plant information
___ Plant propagation program which includes native species
___ Research programs pertaining to native plants
___ Educational programs pertaining to native plants
___ Ex-situ conservation program
___ Native plant distribution or sales program

25. How would you describe the future role of native plant garden displays at your institution?

- ___ Becoming more important
___ Becoming less important
___ Remaining the same
___ Do not know

26. In your opinion, how has visitor interest in native plants changed during the past 3 years?

- ___ Visitors are much more interested
___ Visitors are slightly more interested
___ No change in visitor interest
___ Visitors are slightly less interested
___ Visitors are much less interested
___ Do not know

* APPENDIX 2

Questionnaire completed by staff participants

1. Why, in your opinion, are these habitat areas part of your institution?
2. What do you think is the educational message of the habitat areas?
3. How do you think the average visitor responds to and perceives these habitats?
4. In your opinion, what new knowledge does the average visitor actually take away from the habitat exhibit area?

5. By what mechanisms (reading signs and pamphlets, experiencing the garden, etc.) do you believe visitors actually learn in the habitat exhibit areas?

6. In your opinion, how effective is the content of interpretive materials (sign, pamphlets, etc.) in conveying the exhibit's educational message to the visitor? (please circle the appropriate number)

Very Effective

Not Effective

1 2 3 4 5

- 6a. What changes, if any, would you recommend?

7. How effective is the quantity and placement of interpretive materials in conveying the exhibit's educational message to the visitor?

Very Effective

Not Effective

1 2 3 4 5

- 7a. What changes, if any, would you recommend?

8. How effectively does NCBG visitor orientation (directional signs, pamphlets, garden maps, NCBG guides etc.) guide the visitor to the habitats and orient them to their theme?

Very Effective

Not Effective

1 2 3 4 5

- 8a. What changes, if any, would you recommend?

Not Effective

1 2 3 4 5

Securing financial support

	1	2	3	4	5	6	7
very important							not important

11. How would you group your visitors in the following categories?
Please attempt a guess, assigning an approximate percentage to each category (answers should total 100%).
- ☐ Tourists visiting from other areas
 - ☐ First-time visitors from the local community
 - ☐ Repeat visitors from the local community
12. Similarly, use approximate percentages to group your visitors in these categories. (answers should total 100%)
- ☐ School children
 - ☐ College students and University personnel
 - ☐ Amateur horticulturists and home gardeners
 - ☐ Professional horticulturists and plantspeople
 - ☐ Visitors seeking relaxation and recreation, rather than education
 - ☐ Others (please describe)
13. What types of visitors would you like to see more of at your garden?
14. What kinds of exhibits, features and programs do you believe would attract the visitors described in your response to question #11?

15. To what extent do you agree or disagree with the following statements about the role of interpretive elements in the habitat areas of your garden? (please circle the appropriate number)

Interpretive hardware (signs, information panels, etc) is necessary to explain the information content of our native plant habitat displays.

1 2 3 4 5 6 7
strongly agree strongly disagree

Interpretive hardware in our habitat area is often obtrusive and sometimes detrimental to garden aesthetics and visitor enjoyment.

1 2 3 4 5 6 7
strongly agree strongly disagree

The educational message of our habitat exhibits is too complex to be fully conveyed to the layperson via signs and pamphlets. Ideally, a tour guide would interpret our habitat exhibits to visitors.

1 2 3 4 5 6 7
strongly agree strongly disagree

The purpose of our habitat areas is more to foster appreciation of the plants than to teach visitors about specific topics. Their beauty and inherent interest requires little interpretation.

1 2 3 4 5 6 7
strongly agree strongly disagree

16. In your opinion, how important are the following factors in drawing visitors to the habitat exhibits in your garden?

They provide an opportunity to relax and enjoy nature in a pleasant atmosphere.

1 2 3 4 5 6 7
very important not important

Our habitat exhibits allow visitors to experience the visual character of wild plant communities and/or the floristic character of our region.

1 2 3 4 5 6 7
very important not important

Our habitat exhibits demonstrate the ecological relationships between various taxa and environmental factors, providing a valuable educational experience.

	1	2	3	4	5	6	7
very important							not important

17. In designing habitat exhibits which attempt to capture or simulate the visual character of a particular plant community, how important, in your opinion, are the following design criteria?

Relative abundance of a particular species within a community.

	1	2	3	4	5	6	7
very important							not important

Structural elements of a particular plant community (herb layer, shrub understory, canopy, etc.)

	1	2	3	4	5	6	7
very important							not important

Vegetation density

	1	2	3	4	5	6	7
very important							not important

Representation of important component species within a community

	1	2	3	4	5	6	7
very important							not important

Displaying the more ornamental and eye-catching members of a particular plant community.

	1	2	3	4	5	6	7
very important							not important

Simulating the ground texture, rock strata, water features and other abiotic characteristics of a particular habitat.

	1	2	3	4	5	6	7
very important							not important

18. As your institution designs habitat gardens intended to capture the interest and attention of your visitors, how important of a role do you think the following factors play?

Providing seasonal floral displays and abundant color

1 2 3 4 5 6 7
very important not important

Presenting engaging imagery and new concepts through planting design and use of site elements (rocks, water features, etc.)

1 2 3 4 5 6 7
very important not important

Creating well-composed designs with strong focal points and first-rate interpretation, directing visitor attention and encouraging visitor learning

1 2 3 4 5 6 7
very important not important

Creating landscapes that capture the look of a native habitat

1 2 3 4 5 6 7
very important not important

Placing individual plants and plant combinations so they can be closely studied and well appreciated

1 2 3 4 5 6 7
very important not important

Creating landscapes that are original and unique to the garden site, providing a memorable experience for visitors

1 2 3 4 5 6 7
very important not important

* APPENDIX 3

Some questions asked of staff in interviews

What would you say is the educational message of the habitat displays?

Do you think people learn in this garden?

How do you think they learn?

How do you think people react to the habitats?

Have you ever talked to visitors about the display? What did they say?

Have you ever observed visitors move through the display? How did they seem to react to the displays?

What do you think is successful about the displays?

How do you think the habitat displays could be improved?

C

C