The Importance of Aesthetics in Ecological Landscapes for Residential Neighborhoods

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Abstract

Private homeowners form a suburban and exurban landscape context that is bound by commonly shared societal perceptions of landscape aesthetics. Landscape patterns within this matrix often reveal a repetition of similar sized residential lots with minimal plant material and little, if any, native vegetative cover. The landscape patterns of these individual lots generally consist of a large lawn, sparse foundation plantings, and one or two trees. While these types of landscapes typically meet cultural expectations of landscape aesthetics, they are resource intensive and lacking in biodiversity. Although ecological landscapes are slowly gaining in popularity due to a decline of wildlife habitat, water restrictions, and an overall desire for reduced resource input, designed ecological landscapes are often shunned because they fall short in meeting cultural desires for certain landscape aesthetics. This project combines common cultural expectations of landscape appearance with design methods of preserving and increasing biodiversity to create ecologically and culturally sustainable design guidelines for homeowners and subdivision developers.
List of Terms

*Anthropogenic landscape approach* (Hitchmough and Dunnett, 2004): This is an aesthetic approach geared towards nature-like design of disturbed sites where conditions have been altered to the degree that some of the native plants growing prior to disturbance will no longer survive under altered conditions. Native plants that can grow under the disturbed conditions are preferred, but non-invasive exotic plants are also included in this approach because they may be better suited for the altered landscape conditions and provide structure for habitat and visual quality.

*Cues to care*: landscape patterns or looks that send a message that the landscape is cared for and intentional (Nassauer, 1997).

*Cultural norms*: internalized beliefs about what other people feel (Nassauer, 1997).

*Ecological landscape design*: For the purpose of this project, designed plantings that are structured around natural processes and/or natural plant communities specifically for enhancing biodiversity.

*English Naturalistic*: a landscape style inspired by the English Landscape Movement; This style is typically observed in parklands with open grassy spaces and trees scattered singly or in groups around the space’s perimeter (Figure 1).

*Florida-friendly landscaping*: landscape design, installation, and maintenance standards that conserve water, protect the environment, and are adaptable to local conditions, and are drought tolerant (2009 Florida Statutes)

*Florida Senate Bill 2080*: This bill includes design and implementation of incentive programs to promote local governments to adopt new ordinances or modify existing ordinances to require Florida-friendly landscaping (2009 Florida Statutes). The bill also states that the use of Florida-friendly landscaping and other water use and pollution prevention
measures serves a compelling public interest and that the participation of homeowners’ associations and local governments is essential to improve the state’s water quality, protection and restoration (2009 Florida Statutes).

*Picturesque/scenic landscapes*: natural scenes that contain open views or vistas; plus elements such as curving sightlines that suggest that there is more to discover.

*Landscape aesthetics*: of or concerning the appreciation of landscape beauty; a variety of factors can influence why humans are attracted to certain landscape styles, and not all people have the same landscape preference. However, research (see Chapter 1: Perceptions of the Landscape) suggests that people tend to have a preference to landscapes that resemble the English Naturalistic and picturesque styles. Research also suggests that within the built environment, people tend to prefer landscapes that express “cues to care” (Nassauer, 1997).

*Naturalistic landscapes*: (as described my author) landscapes characterized by a woodland-like appearance with no open views or sightlines or an assortment of shrub material with no structured pattern and a lack of human cues to care.
Chapter 1: Introduction

Large areas of the United States are covered with suburban landscapes that contain a limited number of plant species. Similar sized lots and housing placements and unsustainable landscape features are characteristic patterns of these landscapes. The cultural norm dominating suburban landscapes is that of idealized perfection—manicured and maintained landscapes that show human intent. This aesthetic is generally made up of closely mown lawns, meager foundation plantings and one or two trees. Such landscapes are resource intensive, support a minimal amount of wildlife, and have left isolated fragments of undisturbed natural areas scattered between them. The use of ecological planting design methods to create wildlife corridors for small animals, specifically birds and insects, within suburban developments would improve ecological health. But, the sometimes unkempt and often wild-looking appearance of ecological designs has prevented homeowners and developers from accepting and incorporating them in their landscapes. However, patterns in the built form can provide insight on how to design positive aesthetic experiences and at the same time promote healthier ecological processes. The combination of pattern and ecological landscape design techniques can resolve the conflict between ecologically healthy and publically accepted landscapes by including signs of landscape maintenance processes.

Several theories propose explanations on why humans have certain aesthetic preferences for landscapes. For example, some theories propose that our preferences for scenic landscape qualities were highly influenced by 17th and early 19th century landscape painters and the European picturesque movement (cite references), while others propose that humans have
evolutionary and innate responses for landscapes with open views and peripheral forest canopy (Nassauer, 1997). Extensive research on the types of landscapes that drive human aesthetic preferences in urban and suburban environments shows that people are highly influenced by cultural norms and community norms; which are defined as internalized beliefs about what other people feel and community internalized social rules, respectively (Nassauer, 1997). The combination of theoretical and qualitative research can assist in building our understanding of why homeowners have specific aesthetic preferences and assist designers in developing new techniques that incorporate human aesthetic preferences while promoting ecological health.

A deeper understanding of the scale at which humans perceive the landscape is an important consideration for designs that combine human aesthetic preferences and promote ecological health. Life occurs at varies scales, but humans interact with the environment at a particular scale, or the “human perceptible realm” (Gobster et al., 2008). Scales of ecological processes, however can range from life at a microscopic level to a small backyard pond, or a forest expanding over hundreds of acres. Human understanding of these processes is often diminished because we do not have the ability to simultaneously perceive large and small scale ecological processes (Gobster et al., 2008).

Our interaction with the environment can cause landscape change, and more specifically our desired landscape experiences within the landscape can cause us to positively or negatively alter the landscape. For example, a homeowner may wish to have a landscape that supports birds and this desired experience causes the homeowner to incorporate a diverse plant palette in their landscape that consists of plants that provide bird habitat and food. Alternatively, a homeowner may desire a landscape that consists mostly of lawn. Both examples show how our desires for certain
landscape experiences can influence us to change the landscape to either promote or decrease ecological health. By examining how humans interact with the landscape, designers can intervene and create landscapes that provide desired human experiences and increase ecological health.

Patterns in the built form can provide insight on how to design for positive aesthetic experiences and also promote healthier ecological processes. Pattern is often used in design to create overall visual order and unity and it is typically expressed when repeated elements are organized in a recognizable sequence. The use of pattern is important in landscapes because visual order is associated with aesthetic appeal. Unity, line and repetition are design elements that create pattern. Unity is the relationship between all design elements, repetition moves the eye across visual motifs of a design and line forms all shapes and directs the eye to the edges of a form. Residential subdivisions reveal a strong ordered pattern. Roads are typically laid out and similar-sized home lots are repeated along them. Landscapes within these developments also reveal similar repeated landscape patterns, typically in the form of foundation plantings. By examining these patterns, designers can intervene and apply new patterns to improve visual order (aesthetics) and ecological function. Examples include the implementation of ecological design techniques to include a continuous canopy of street trees and the addition of plantings along each home’s property line to further increase overall pattern and improve plant diversity, wildlife habitat, and decrease resource use.

The ecological design approach creates landscapes that form human-scaled ecosystems, while at the same time respecting the natural world (Crewe and Forsyth, 2003). This project utilizes ecological design in the form of organized
designed plantings that are structured around natural plant communities specifically for enhancing biodiversity.

Implementing ecological design techniques in suburban subdivisions that have been cleared of vegetation for development can mitigate problems with rapid development; loss of wildlife habitat; resource intensive landscape practices and assist in connecting isolated patches created by development with small wildlife corridors.

**Rationale and Objectives**

The intent of this project is to bridge the gap between ecological design and cultural expectations of a socially acceptable landscape aesthetic. Providing ecological landscape design templates at the neighborhood and individual home site scale will hopefully influence adoption of such designs and enhance local biodiversity. Cultural norms affect homeowners’ aesthetic preferences for their own landscapes and in should they adopt landscape designs that affect ecological health the gap will be bridged (Nassauer et al., 2009). Typical homeowners and homeowner’s associations (HOAs) may not adopt specific landscape designs if they do not believe that the designs will be accepted by their neighbors (Nassauer et al., 2009). Homeowners often adopt the repeated patterns observed in their neighborhood landscapes, which is often the conventional American residential landscape that contains a large lawn and foundation plantings (Nassauer et al., 2009). Ecological landscape designs in the suburban context may be better executed at the neighborhood scale instead of only at the scale of individual properties. Furthermore, these design techniques can enhance ecosystem services, biodiversity, and marketability of environmentally beneficial forms of land development (Nassauer et al., 2009).
Typical HOAs enforce strict landscaping rules. For example, many require homeowners to mow lawns once weekly during growing seasons; lawns must be free of weeds and routinely irrigated (often daily); shrubs must be trimmed to a certain height; and only small trees are permitted. However, in Florida Senate Bill 2080 (landscape legislation) recently passed and HOA’s cannot prevent homeowners from installing a Florida-Friendly landscape. Florida Friendly Landscaping consists of guidelines for reducing water and fertilizer use. The objectives of this project are to synthesize current thinking on ecological landscape design and landscape aesthetic to create design approaches for ecological landscapes that meet societal aesthetic preferences at the neighborhood and home site scales. Guidelines were developed to assist homeowners and developers in the implementation of sustainable and aesthetically pleasing landscape methods.

Chapter 2: Landscape Aesthetics

Perceptions of the Landscape

Landscape preference studies propose several theories to explain our aesthetic preferences for the scenic look of landscapes including: the influence of 17th and early 19th century landscape painters; evolutionary and innate responses; cultural norms; personal experience; and environmental behavior. It has been suggested that the appearance of a landscape is a primary factor in the willingness to adopt certain types of landscapes in residential communities (Nassauer et al., 2009). Efforts to encourage more ecological design of residential landscapes may require a better understanding of the role aesthetics plays in behavior change.
Advocates of ecological design argue that “scenic aestheticians”, such as artists and designers, have encouraged the public’s passive involvement when viewing a landscape. Parsons and Daniel (2002) argue that landscape painters of the 17th century (Figure 2) and 19th century influenced what the American public considers scenic beauty. Additionally, the majority of people in urban places prefer landscapes indicative of the English naturalistic style (Figure 1), which was standard for designers and planners of urban areas in the 19th and 20th century (Jorgensen, 2004). According to Nassauer (1995), Americans associate the appearance of nature with the picturesque gardens in Europe and often perceive naturalistic landscapes as unkempt and messy. This influence has caused landscape viewers to passively see the landscape as a painting. According to Parsons and Daniel (2002), landscape designers have added to this one-dimensional role of landscape perception by copying the picturesque style in the designed landscape. Nassauer (1995) found that people want to protect and conserve nature, but they do not recognize ecological quality in a landscape. She states that “picturesque conventions have become so intrinsic to nature that they are mistaken for ecological quality”.

(Figure 2)(Claude Lorrain <www.oceansbridge.com>)

Note: This 17th century painting by Claude Lorrain has open views of a large, grassy area and a small clustering of trees
Typically, Americans’ perceive picturesque landscapes not only as beautiful, but also healthy (Nassauer, 1995). Picturesque landscapes usually appear static, while natural landscapes are constantly changing and show the presence of time. Nassauer (1995) explains that many of our altered landscapes appear scenic. For example, rolling hills of pasture land may be perceived as scenic, but they are resource intensive and provide little wildlife habitat. It has also been common for people to consider structurally complex, wild-looking landscapes in urban areas to be unsafe (Jorgensen, 2004).

These views of the landscape have resulted in the general public’s preference for planting designs with low biodiversity. Typically, people who do enjoy untidy naturalistic landscape designs have a special interest in ecology and/or nature (Smith et al., 2008). According to Smith et al., (2008), possible explanations of why people tend to prefer ecologically simplistic landscapes include “genetically programmed preferences for the Savannah–like landscapes of our East African origins” (Orians, 1986) and “learnt aesthetic responses to logic and order” (Johnson, 1997).

Other theories for landscape preferences include an instinctual (innate) response to landscapes and reactions to landscapes as a result of cultural background and personal experience (Jorgensen, 2004). Social scientists have proposed that humans have an innate preference for savannah-like landscapes because human evolutionary development occurred in savannah landscapes (Jorgensen, 2004). Some researchers also suggest that people commonly prefer the English naturalistic landscape style because it bears resemblance to a savannah landscape (Jorgensen, 2004). Appleton’s (1975) Prospect/ Refuge Theory proposes that during human evolution, peoples’ ability to see open views
while simultaneously having an option to quickly hide under a shelter of tree canopy enabled survival, which might explain why humans prefer the open lawn spaces with tree clustering surrounding the perimeters. Kaplan and Kaplan’s (1989) ‘preference matrix’ is widely used to explain the psychological and evolutionary reasons behind human preferences for certain landscapes and how they assess their surrounding environment. People understand and react to information in the environment according to the presence of coherence, complexity, legibility, and mystery. The preference matrix reveals preference for naturalistic scenes with open views and curvilinear sight lines that only exposes part of an interesting scene (Kaplan and Kaplan, 1989). The Savannah Theory, Appleton’s Prospect/Refuge Theory and the Kaplans’ preference matrix all display characteristics that are very similar to English landscape style and aid in the explanation of why many humans have particular landscape preferences (Jorgensen, 2004).

* Cultural Norms and Landscape Aesthetics*

A cultural norm, where people tend to evaluate landscape aesthetics based on their level of care, exists throughout North America and Northern Europe (Nassauer, 1997). In human inhabited landscapes, care is displayed by neatness:

“a neat and tidy lawn is so expected that we have ordinances to force conformity upon those who do not take care of their lawns properly. People who do not mow their lawns are assumed to have problems that prevent them from doing the right thing” (Nassauer 1997).

While our society has had good intentions of displaying a sense of pride in the landscape, it has resulted in diminished ecosystem vitality. The ecologically destructive effects of the overuse or misuse of lawn care products, pesticide usage
and clearings for development are examples of how culture has neglected nature and provide a strong case for why the
two should work together (Nassauer 1997). A cultural aesthetic has emerged within society for manicured and maintained
landscapes that show human intent. This deep-rooted cultural aesthetic must be taken into consideration in ecological
landscape design for landscapes to be sustainable (Nassauer 1997). In other words, ecological health and cultural
aesthetics must be aligned in order for people accept sustainable landscapes.

Nassauer (1997) stresses the analysis of conventional cultural aesthetics along with requirements of ecological
health in designed landscapes. By addressing ecological health and cultural expectations of what landscapes should look
like, landscapes have a greater chance of being acknowledged and protected. She states:

“if we acknowledge that we live in a human dominated world, in which human perception of the landscape will
ultimately affect how every landscape is used or protected, then we are led to find ways to use ready-made cultural
necessities”.

Ecologically healthy landscapes that attract positive attention have a greater chance of lasting than wild-looking
ecologically sound landscapes that are largely ignored (Dunnett and Hitchmough, 2004; Meyer, 2008; Mozingo, 1997;
Nassauer, 1997). Ecological health in urban environments is therefore dependent on human acknowledgement and
attention. People view the landscape according to its involvement in their daily routines, gardening hobbies, farming,
recreation, and pictures. These observations become familiar and influence peoples’ understanding and attention to the
landscape. Our perception of care is determined by familiarity, and the more familiar we are with a particular subject, the
more discerning our perception is of that subject. Tended horticultural plants have become familiar objects in conventional American landscapes and strongly influence our perception of care. People who notice plants typically put forth the most effort to maintain horticultural plants (Nassauer 1997).

Cultural norms for landscape appearances, particularly of residential yards, can be determining factors of whether or not people will incorporate ecological design in residential landscapes (Nassauer et al., 2009). Preferences of people living in urban environments have been proven to be greatly influenced by community norms (i.e. internalized social rules) and cultural norms (i.e. internalized beliefs about what other people feel) (Nassauer et al., 2009). In commercial situations, lack of acceptance from customers can have a powerful influence on measures a business owner will take. For example, a developer may not adopt an ecological landscape design that is not similar to the conventional American landscape due to apprehension that buyers will not accept a landscape design different from the standard. Nassauer et al., (2009) describes neighborhood influence as follows: Homeowners may decide not to adopt ecological design innovations out of fear that their neighbors could disprove of the way the landscape looks (Nassauer et al., 2009).

In a photographically-based survey (to examine the relationship of neighborhood and cultural norms and individual preferences) of residents Nassauer et al.,(2009) used surveys with images of six different front yard designs, ranging from yards containing mostly lawn to highly wooded yards to a yard with a native prairie design. Results indicated that both cultural norms, and more significantly, neighborhood norms strongly influenced home owners’ landscape decisions for their yards. Participants ranked yards according to “most conventional” or “most ecological” based on yard designs of
nearby neighbors. Nassauer concluded that ecological design approaches for residential landscapes should occur at the neighborhood scale, not at the individual homes scale, in order to enhance initial and long term success of cultural sustainability.

*Ecology and Scale*

Examining the relationship between aesthetics, ecology and design scale enables designers to have a deeper understanding of how to design to attract peoples’ interest and enhance ecological health. In most design situations, aesthetics can either work with or against ecology. Humans have great impact on the environment, so it important to understand our relationships with landscape scales we can and cannot relate to (Gobster et al., 2007). In order to clarify the connection between aesthetics, ecology and scale, Gobster et al., (2007) devised a conceptual model of the “aesthetic-ecology relationship”. The model states: although human and non-human life exists at various scales, humans experience the surrounding environment at a particular scale (i.e. the human perceptible realm). Scales of ecological processes can range from the life at a microscopic level to a small backyard pond, or a forest expanding over hundreds of acres. Human understanding and concern of minute and large scale ecosystems is diminished because such scales are outside of the typical perceptible realm. Therefore, aesthetic experience resulting from interaction with nature within the human perceptible realm can result in landscape and ecological change (Gobster et al., 2007).

The human desires to visit and protect beautiful places and to beautify unattractive places are examples of ways that aesthetic experiences influence landscape change (Gobster et al., 2007). The love of scenic national parks and
forests has resulted in policies for their protection and the appreciation of scenic landscapes has led people to associate scenic beauty with ecological quality, when realistically the two are not directly related (Gobster et al., 2007). The examination of what people perceive in the landscape as aesthetically pleasing can greatly assist in increasing landscape sustainability and gaining public support of “ecologically motivated landscape change” (Gobster et al., 2007). Human aesthetic preferences and ecological health are opposed. In some instances, ecologically healthy ecosystems are perceived as attractive, but they are more often perceived as unattractive. Wetlands, for example, are sometimes perceived as messy and people may not understand or appreciate their biological complexity and health. Man-made ecological landscapes, such as habitat restoration projects that do not appear to be designed, have also been considered unattractive because they do not exhibit scenic or visibly maintained qualities (Gobster et al., 2007). Gobster et al., (2007) advocate that by examining what the public views as ecologically healthy and aesthetically pleasing, a new design language or "an ecological aesthetic" can be created to improve and increase the use of sustainable ecological landscapes.

This ecological aesthetic is motivated by the idea that ecological processes may not conform to visual qualities associated with pleasurable landscape appearance, and that this disjuncture can encourage ecologically damaging anthropogenic landscape change (Gobster et al., 2007).

According to Gobster et al., (2007) the relationship between the environment and human behavior is either transactional or contextual. Transactional relationships occur because humans and the environment change each other
by interactions over time. Contextual relationships occur because human behavior is modified by characteristics of specific places and occurrences. Change is a result of interactions between humans and landscapes, and changes at specific contexts and scales alter cultural and ecological systems. Gobster et al., (2007) use the human perceptible realm model to explain the relationship of ecology and landscape aesthetics. At this scale, human aesthetic experiences take place and “intentional actions towards landscapes can directly or indirectly affect ecological functions.”

While some scenic landscapes are ecologically healthy, other landscapes created by human aesthetic preferences negatively affect ecological systems. Landscape design and management can be powerful tools in aligning human aesthetic desires and ecological requirements for health. According to the Gobster et al., (2007), actions such as design interventions can alter perceptible landscape patterns to establish a closer connection between human perception and ecological function outside of this realm. Ecological design has typically leaned towards addressing only ecological health and function (Dunnet and Hitchmough, 2004; Gobster et al., 2007; Meyer, 2008; Mozingo, 1997). The authors stress that designs focused on improving ecological health should also provide positive aesthetic experiences that meet public aesthetic expectations for a specific landscape context. By exploring the human perceptible realm designers can intervene to accommodate human aesthetic desires and ecological health, thereby increasing sustainability.

*Landscape Patterns*

Pattern is used in all aspects of design and it is typically expressed when repeated elements are organized in a recognizable sequence. Unity, line, and repetition are design elements that create pattern. Unity implies that there is a
relation between all elements in a design. If design unity is achieved, elements look as if they belong together (Lauer, 1985). When a design does not express unity, elements appear separated and disjointed and pattern is usually broken. Repetition is related to the movement of a viewer’s eye across repeated motifs of a design (Lauer, 1985). Repetition can also be defined as “any visual pattern that causes the eye to move quickly and easily from one element to another” For repetition to exist, a sequence of elements that are the same or similar must be apparent. Finally, line is an essential part of pattern because it forms all shapes. Lauer (1985) defines lines as a “moving dot”. Line is especially important when edges or contours of forms are strong features of an object. Line will then direct the viewer’s eye to the edges of the form. It is important to understand the basis of how pattern is created because it plays a part in how human development and nature are structured and organized.

Studies on pattern in the built form, such as architecture, provide insight into the perception and use of pattern for visual order and unity within the landscape. Smith (2003) explains that people view patterns as visually appealing by the visual order in the patterns of buildings lining city streets. According to Smith (2003), “the mind has the ability to highlight pattern factors and play down differences”. He uses examples of the organizations of buildings along streets in European countries, which have unity through rhythm, expressed as the repetition of elements in a predictable sequence. Buildings are united by a pattern of elements such as narrow frontage, gables, materials and a high ratio of window to wall (Fig 3) (Smith, 2003). The buildings exhibit visual interest and diversity by individual embellishments however, the repetition creates a unifying pattern that is more noticeable and higher on the level of visual hierarchy (Smith, 2003). People find
patterns visually appealing (Smith 2003). Smith’s examples can be applied to elements in the landscape, such as plant material, that are arranged or organized in an orderly composition to create unity in the landscape.

Orderly and interesting planting designs are often created by strong pattern and line forms. Successful grouping of different plant types result in visual unity (Scarfone, 2007). The process to create successful pattern and line forms typically includes drifts of various mass plantings that form interlocking and interweaving groups (Scarfone, 2007) (Figure 4). This grouping “must occur front to back, side to side, and top to bottom, in order to link all portions of the planting together in a seamless whole” and amounts of overlap should also change throughout the planting (Figure 5) (Scarfone 2007). For example, one massing can overlap an adjacent mass by 30% while another mass will overlap by 50% (Figure 7). Widths of all massings in a composition should be proportionate for achieving uniformity of visual weight (Scarfone,
Mass plantings should be arranged to allow the background formed by one plant type to accentuate the foreground of another plant type (Figure 5). These “bold masses of various plant types best showcase the aesthetic qualities of the individual plant characteristics” (Scarfone, 2007). Scarfone (2007) also stresses that plant pattern arrangements should always include consideration of seasonal interest. For example, when seasonal interest from one plant begins to dissipate the adjacent grouping should begin to show seasonal change.
Dubé (1997) encourages metaphoric thinking or “the essence of the original” as a means for designers to perceive a natural pattern form and transfer it to a design application or concept. According to Dubé, we have an emotional response to natural pattern forms and an intuitive attraction to nature’s aesthetics because our subconscious identifies the natural forms that surround us. The “metaphoric approach to design” has been used throughout history (Dubé, 1997). Dubé reviews the history of the use of nature as a metaphoric approach (e.g. mimicking nature) to design in Asian gardens. Asian landscapes have a respected reputation for borrowing scenes from large scale landscapes and replicating them in a small scale garden. For example, Japanese sand gardens have been inspired by ripple patterns created from objects dropped in water. Japanese designers mimicking nature then transferred this image to a sand garden with rocks surrounded by raked radial ripple patterns (Dubé, 1997).

Dubé (1997) explains how to understand natural pattern forms by exploring the aesthetics and proportions of these forms. Although aesthetics and visual appeal are typically considered subjective and based on personal preference, Dubé argues that a large portion of the human population finds beauty in natural pattern forms. The tendency for humans for find pattern forms aesthetically appealing can be explained by holonomy, the ability to view an object as a whole and also analyze its individual parts (Dubé, 1997). Right-brained people prefer to view objects in their entirety, and left-brained people prefer to view individual parts of objects (Dubé, 1997). Dubé states that “total-brain thinking considerably enhances one’s aesthetic experience of any given form or pattern. He explains the repetition of a part within a whole of a natural pattern form promotes total brain thinking, thereby enhancing the visual experience. Moreover, Dubé (1997)
stresses the importance of examining a site’s internal, external, and regional context. External context is defined as “where objects or groups of objects have a common purpose and/or relation to their surroundings” (Dubé, 1997). Internal context occurs when a design is based on a set of ideas and design elements may or may not be related to their surroundings (Dubé, 1997). Regional context is viewed according to its “geographical, botanical, meteorological, or watershed” location (Dubé 1997).

Patterns of developed sites reveal natural and cultural influences (Dinep and Schwab, 2010). A common pattern can be seen throughout many subdivision developments in the U.S., where an entire site is often organized into a street grid pattern with areas for stormwater treatment. Individual home lots are laid out along the street grid and natural areas may or may not exist surrounding the subdivision. It is also typical to see repeated yard patterns, where individual homes will have a large lawn, foundation planting, and 1 or 2 trees. By understanding what is unsustainable about cultural influences in typical developments, new design techniques can be applied to suburban landscapes that reflect culture while improving ecological health.

Chapter 3: Sustainable Landscape Design

Defining Sustainable Landscapes

The design of spaces can affect how we live and encourage us to develop more sustainable lifestyles. Great attempts have been made to design sustainable buildings, but in many cases fewer efforts have been applied to
residential and commercial landscapes, perhaps because many presume that all green spaces are sustainable, although they can be energy-consuming, polluting, wasteful, and offer minimal wildlife value (Smith et al., 2008). A landscape that has been altered by human activity can either improve or reduce its ecological health. In many cases, designed landscapes encourage maintenance practices that require excesses of water, pesticides, fertilizers, and other non-renewable materials, and reduce rather than improve biodiversity (Smith et al., 2008).

Several definitions of sustainable development are offered including:

- Development with “solutions that successfully marry human welfare and ecological robustness” (Barton, 2000).
- Development that “provides a simultaneous increase in the quality of human life and the maintenance of important environmental functions. It is therefore a process involving the improvement of the human condition in a context of environmental sustainability” (Ekins, 2000).
- “One that balances human needs and the environment.” (Smith et al., 2008)
- Thayer (1994) defines a sustainable landscape as one that “contributes to human well-being and at the same time is in harmony with the natural environment, works with native landscape conditions, does not deplete or damage other ecosystems, and conserves valuable resources such as water, soil, nutrients and energy”.
The United Nations defines sustainability as “meeting the needs of the present without compromising the ability of future generations to meet their needs” (Ahern, 2008).

Planting design and maintenance practices effect levels of resource inputs (outputs and pollutants released into the environment). Sustainable planting design practices can be achieved by selecting species that are well-suited to the specific site in which they will be located. Such practices promote healthy growth, and eliminate soil amendments, excessive irrigation, fertilizers and pesticides, and reduce maintenance issues (Smith et al., 2008). According to Ahern (2008), sustainable landscapes should:

Contribute to and not detract from local plant communities and their biodiversity; provide habitat and food for local and wildlife migratory species; grow and reproduce without significant inputs of fertilizers and pesticides; be well adapted to the local climate, particularly in terms of temperature and precipitation; be tolerant and resilient to routine and periodic environmental extremes and disturbances (drought, temperature extremes, wind, fire, flooding, and pests); provide ecosystem services for the benefit of people and the environment; and create beauty and comfort to inspire and inform the community about their local and ecological processes that define and sustain the environment.

By and large over-designed landscapes do not exhibit Ahern’s characteristics of landscape sustainability. For example, landscapes that contain water-consuming lawns, exotic plants, and any form of vegetation requiring pesticide, and fertilizers are typical and are not sustainable.
Ahern’s (2008) seven principles for sustainable landscape plantings are:

1) go beyond right plant, right place
2) heal the earth
3) expect disturbance, build resiliency
4) use plantings as dynamic ecosystems
5) integrate with water and drainage
6) use plantings as green infrastructure
7) inspire others through design.

By going beyond right plant, right place, Ahern (2008) explains that aside from choosing plants that are best suited for a particular location (need minimal water, fertilizer, maintenance), plants should be members of communities and have a specific function within their community. Local plant communities naturally exhibit characteristics of sustainability because they have adjusted over time to their local growing conditions. Local plant communities also promote biodiversity, habitat and food for wildlife, resiliency from natural disturbances, and a sense of place.

Restoration of ecosystems that have been damaged or diminished by human development is Ahern’s meaning of “heal the earth”. He encourages landscape designers to make a habit of enhancing and preserving local ecosystems in every new project that they take on. Ahern (2008) contends that designed ecological plantings can potentially connect forest fragments, stabilize slopes, or restore diminished plant communities. By choosing resilient plants (plants that can
revive after disturbance) that can tolerate natural disturbances, designers can meet the principle of: “expect disturbance, build resiliency”. Creating plant diversity with species that can rebound from disturbance promotes sustainability. By using diverse species in the correct locations, a designer can build resilience for inevitable changes (Ahern, 2008). Common landscape management methods (e.g. extreme pruning and mowing) encourage designs that appear static over time, but such methods work against dynamic natural processes of growth and change. By understanding the process of succession (expected change in the structure of an ecological community), landscapes can be designed and managed to highlight their dynamic characteristics. Professionals can use these natural processes to create appealing and functional landscapes with fewer plants and minimal maintenance. Such processes allow all plantings to be utilized as dynamic ecosystems (Ahern, 2008).

Sustainable planting can not only improve ecosystem health, but also increase aesthetic value of a location. Aesthetically pleasing ecological landscapes are sustainable because they can inspire replication from others and are likely to last for long periods of time. When plantings are beautiful and sustainable, “they catch attention and make abstract ideas and intentions of sustainability real parts of private and public gardens and landscapes” (Ahern, 2008).

Sense of Place

Designs that embrace regional characteristics, such as native plants and local architecture and culture tend to express a strong sense of place.
A design that juxtaposes natural and human order prompts the contemplation of what it means to be human. Design that fosters and intensifies the experience of temporal and spatial scales facilitates both this reflection upon personal change and the search for identity and the sense of unity with a larger whole. A design that resonates with the natural and cultural rhythms of a place, that echoes, amplifies, clarifies, or extends them, contributes to a sense of rootedness in time and space (Spirn, 1988).

A complex relationship occurs between human development and nature and when this relationship is considered in landscape design, a strong sense of place is expressed (Spirn, 1988). Human settlement is both “natural and contrived,” and it has modified natural processes to serve human needs (Spirn, 1988). Human development should work with the surrounding natural habitat in order to effectively form a sense of place and establish a healthy environment. Subsequently, patterns in human settlement illustrate relationships between people and nature through its urban form (Spirn, 1988). These narratives of human development can contribute to forming a new aesthetic and theoretical approach to urban design. Spirn (1988) challenges landscape architects to use these narratives of who we are and our place in the world through design. Design which emphasizes the natural environment strengthens our understanding of natural processes that we are dependent on (Spirn, 1988). These ideas can be applied to the patterns and forms of the Florida vernacular landscape to strengthen design within an ecological, aesthetic, and regional context.
Ecological Protection

Chronic and persistent adverse effects of human development on environment demand change in landscape design and management:

- Human development has left isolated patches of natural areas scattered between cities, suburbia and agricultural land.
- Approximately, two million acres of the U.S. is covered with lawn and limited plant palettes that rarely include native plants (Tallamy, 2007).
- The majority of urban and suburban landscapes consist of a limited number of ornamental plant species.
- This narrow number of plant species is not enough to support native wildlife and is resource intensive.

Planners and developers can improve environmental conditions by implementing landscape design methods in residential subdivisions that provide human aesthetic desires (i.e. cues to care), wildlife corridors, increased biodiversity, and a reduction of resource inputs.

Nassauer (1997) promotes adding ecological protection strategies that addresses the use of private land to the existing land acquisition strategies. The success of these strategies can be brought about by including cultural aesthetic expectations in landscape design of private land. In other words, new forms of ecological protection “would result in landscape patterns that build ecological health out of cultural necessity” (Nassauer 1997). Strategies involving ecological protection of private land must address the role of private land within the larger landscape (Nassauer 1997). By analyzing
landscape scale, designers may be better suited to form connections between fragmented ecosystems in urban communities to larger ecosystems. Landscape scale often means the combination of ecosystems perceivable as management units to humans, so landscape scale could mean a yard, a national park, or a watershed. In each case, ecological functions of individual patches of lakes, streams, and turf are connected to one another (Nassauer 1997).

Private landowners are accustomed to having the freedom to make their own decisions regarding the use of their property. Private land forms small parts of a larger landscape that reflects commonly shared perceptions within society of landscape aesthetics (Nassauer 1997). In order to intertwine aesthetics and ecology for a more sustainable landscape, society must find solutions to use these cultural expectations of aesthetics to form a connected matrix of biodiverse ecosystems (Nassauer 1997).

**Barriers to the Acceptance of Ecological Design**

Sustainable design is often defined by ecological, social and economic models. According to Meyer (2008), aesthetics are frequently considered superficial. For example, one may question how the value of aesthetics can compare to the value of improving human and ecological health. Arguments have been made that ecological/sustainable design must not only function ecologically, but also perform socially and culturally (Meyer, 2008). If designed properly, a site can illustrate the interconnections between hydrology, ecology and human life.

Many ecological landscapes are centered on function and do not appear to be designed for the user or for visual interest. For example, an ecological design project may focus primarily on Best Management Practices (BMPs) or habitat
restoration with native plants (Meyer, 2008). Ecological landscapes should incorporate elements that allow human experiences as well as improved ecological health. The designed landscapes do not cover a large percentage of the earth, but “they are visited and inhabited by people who have a great impact on the environment in everything they do, how they live and commute, what they consume, and who they elect to public office” (Meyer 2008). When human experiences are included in ecological designs, people have a greater chance of appreciating them.

Ecological design methods can provoke arguments concerning what is truly ecological for a specific site. Naturalistic and ecological design is often associated with habitat restoration, where restoring damaged ecological systems back to their initial state is the goal and aesthetics are not part of the design intentions (Dunnett and Hitchmough, 2004). Habitat restoration projects in urbanized areas are often ignored because they are typically located in left over urban spaces. This often results in the public perceiving urban habit restoration projects as messy and unattractive. People tend to accept landscapes created by habitat restorations only when they are located in rural or natural areas; while they are perceived as weedy when they are located in urban settings (Dunnett and Hitchmough, 2004). Other studies on the relationship between people and the landscape have shown that many ecological designs do not meet human aesthetic desires for order, meaning and beauty (Woodward, 1997).

Since the beginning of the twenty-first century, nature-like landscape experiences have typically been limited to particular types of settings, such as fragmented forest land considered unsuitable for development, over-grown derelict or brownfield sites, abandoned land or structures, vegetation lining waterbodies, and nature-reserves (Jorgensen, 2004).
These types of places often provoke negative reactions from the public because they exhibit signs of abandonment and neglect. Alternatively, urban parks and public greenspaces typically exhibit design styles similar to the large lawn floral beds and open views of the English landscape and Victorian movement (Jorgensen, 2004). Jorgensen (2004) states “given these polarities, it is not surprising that people may find the idea of deliberate ecological plantings in public spaces difficult to appreciate”.

Ecological landscapes that address appearance and function can also suggest a sense of place by utilizing local plants, architecture, and hardscape elements to attain green spaces that are evocative of a particular location instead of landscapes that lack regional character. These types of designed places are more likely to gain public support and acceptance than ecological designed places that do not consider aesthetics. Beautiful ecological landscape can be tool to capture public attention, and promote environmental education and care (Meyer, 2008; Mozingo, 1997). Moreover, Dunnett and Hitchmough (2004) argue that ecological landscapes that do not take aesthetics into consideration are not sustainable because human user needs are not a part of design goals. A more sustainable method of ecological design would seek to connect the relationship between human desired aesthetics, landscape ecology, and the character of the place. Designed, naturalistic landscapes in urban environments must include aesthetic principles if they are to be accepted and valued by the public (Dunnett and Hitchmough, 2004).

A relationship between cultural and ecological function must be present for healthy ecosystems to exist (Dunnett and Hitchmough, 2004; Meyer, 2008; Nassauer, 1997). Humans have deep-rooted cultural expectations of landscape
appearance (Nassauer 1997). Americans associate scenic landscapes with European picturesque design and view “attractive” landscapes as those showing visible signs of care. The scenic and aesthetic perceptions of how a landscape should look are “culturally ingrained, conceptually well-developed, and resistant to change” (Nassauer 1997). Human and biodiversity needs must also be combined for ecological designs to be successful: “ecological design should take place at the interface between the landscape forms of human needs and the landscape forms of biodiversity” (Mozingo, 1997). Typical suburban landscapes are resource intensive and offer little biodiversity. However, Nassauer’s (1995) “Messy Ecosystems, Orderly Frames” model enables a culturally recognizable language that allows designers to intertwine ecological function and natural appearance with culturally familiar signs of care.

When ecological function is framed by cultural language, it is not obliterated or covered up. It is set up for viewing, so that people can see it in a new way. Using cues to care in design utilizes the cultural expectations of conventional American landscapes to create new landscape forms that include a greater biodiversity (Nassauer 1995).

**Chapter 4: Environmental Threats**

*Land Development*

A large portion of ecologically sound land in North America is public land (e.g. parks and reserves), while urban and suburban land tends to be ecologically fragmented. Human development has resulted in disconnected remnant patches of natural habitats. Individual homeowners can begin to connect these remnant patches by incorporating methods
of planting design that combine cultural and ecological needs. Tallamy (2008) discusses the effects of development on
wildlife habitat and stresses the vital role that home landscapes can play to increase wildlife habitat by adding native
plants to their landscapes. He explains the strong interconnection between native plants and native wildlife. Native wildlife
depends on native plants for food, and as native plants disappear, so does native wildlife.

According to the Preservation Institute (2000), 29.9 million acres of U.S. land was developed between 1982 and
the amount of developed land between 6–8% of the surface area of the contiguous US, with lawns making up roughly 32
million acres of developed land in urban and suburban areas (Lindsey 2005). Native plants do not make up the typical
plant palettes of urban and suburban landscapes, therefore adequate food and shelter for wildlife is not being provided.

Lack of Biodiversity

Biodiversity is the richness of animal and plant species that form terrestrial, aquatic and marine ecosystems (CIEL, 2010). Biodiversity enhances sources of food, shelter, and medicine for humans; creates ecosystems that replenish
oxygen, enrich soil, purify water, and regulate climate (CIEL, 2010); and enhances food-webs on which multiple species
depend. For example, 37% of all fauna are herbivorous insects (Figure 9) that convert plant tissue to animal tissue and as
a consequence excel at providing food in the form of themselves for other species (Tallamy, 2007). Without insects native
fauna will decline. Native birds are one example of animals that rely on native insects for sustenance (Figure 10).
Furthermore, native plants and native insects have evolved in and adapted to their indigenous habitat over long periods of time. Native insects often do not eat alien plants because of the long evolutionary time required to adapt to the novel chemical composition of alien plants. Insects can only tolerate a “narrow group of chemicals to which they have been repeatedly exposed to over thousands of generations” (Tallamy, 2007). Ninety percent of insect species, most of our native insects, are specialists; meaning they can only eat certain plant species (Bernays and Graham, 1988). The remaining 10% are generalists that can eat non-native plants due to special enzymes that allow them to digest exotics. For example, only 8 species of insects are reported to eat the leaves of *Melaleuca quinquinervia*, a highly invasive tree in
In Australia, *M. quinquervia*’s native habitat, 409 arthropods are known to eat this plant (Costello et al., 1995).

Invasive-exotic plants from other parts of the world have out-competed a large portion of the native flora because once they are relocated to a non-native habitat they face fewer or no natural predators to keep them in check. Gardeners and landscape professionals have created a great demand for pest-free (i.e. free of natural predators) exotic plants to which the nursery industry has been quick to supply (Tallamy, 2007). Extremely destructive diseases and pests have come along with this supply of exotic plants. For example, *Cryphonectria parasitica*, a fungus from Asia, was the causal agent for complete loss of the American Chestnut, the primary nut producer of wildlife in Eastern Forests. Citrus Greening, caused by *Candidatus liberibacter* a bacterium that makes citrus inedible and is spread by the Asian citrus psyllid (*Diaphorina citri*), was brought into Florida on infested orange jasmine, an exotic ornamental species. Sudden Oak Death, a disease carried by ornamental *Rhododendron*, was initially imported from Germany and has also been problematic (Tallamy, 2007).

In addition to challenges posed by invasive species, isolated patches of undisturbed land in the US are not enough to support the continuing existence of native wildlife. Extinction rates are higher in isolated patches of land because if an isolated patch ceases to provide adequate food and shelter then wildlife must travel to locate these resources. However, wildlife movement is often blocked by human development.
Landscape professionals and developers should work to change the design of urban and suburban spaces to accommodate native plant and animal species or native wildlife will continue to decline at a rapid rate. Gardens and landscapes must become more complex and diverse to support native wildlife. According to Tallamy (2007), the biodiversity web functions by including many levels of redundancy. Each tropic (1st level = plants, 2nd level = animals) level should be represented by several species that perform similar functions. Therefore, if one species is lost from the food web the web will not collapse because other species can act as proxies for the lost species. Redundancy in plants creates redundancy in the community of organisms that rely on plants. Monoculture plantings that are prevalent in residential yards only support a few species of insect herbivores (Tallamy, 2007). High levels of plant diversity in suburban landscapes can lower pest populations without the use of pesticides (Tallamy, 2007).

Aesthetic tolerance limits that direct gardener’s decision to use pesticides on plants with insect damage have been quantified (Sadst and Raupp, 1996 cited in Tallamy, 2008). Results suggest that insects can damage as much as 10% of the foliage in a garden before a gardener notices (Tallamy, 2007). If a landscape is planted with a diverse native palette then the order of the food chain will keep noticeable pest damage under control. According to Tallamy (2008), “a mere 1% of insects interact with humans in negative ways. The other 99% pollinate plants, return the nutrients in dead plants and animals to the soil and provide food either directly or indirectly to most other animals”.

The use of native species as a means of promoting sustainability can be validated due to their adaptation to the local climate and soil conditions (Kendle & Rose, 2000). Many urban sites however, have modified soil and climate
characteristics (Smith et al., 2008). Well-adapted non-invasive exotics can also be beneficial to a site by stabilizing soil and providing habitat. Selecting the appropriate planting style for a site can reduce, but never eliminate, maintenance efforts (Smith et. al., 2008). Diverse plant selections have proven to attract fewer insect infestations than plant monocultures (Figure 11). Smith et al., 2008 suggest that monocultures can also appear dull and reduce visual interest. Diverse plant palettes are dynamic, self-regenerative, promote nutrient cycling, and minimize maintenance requirements (Smith et al., 2008). These forms of naturalistic planting designs should include plant choices with physiological traits that allow them to commonly survive in a community (Smith et. al., 2008).

(Figure 11: Diverse plant selection verses lawn monoculture) (Tallamy, 2007)

Smith et al., (2008) have provided the following examples of ecological landscape design approaches that aid in reducing habitat and biodiversity degradation:
1) Identify and plan for what already exists; a fundamental objective should be the enrichment of existing ecological capital

2) Restore existing habitats which have been degraded

3) Identify future potential

4) Create new habitats where land offers potential opportunities

5) Restore and create appropriate connections between habitats (Smith et al., 2008).

Fragmented wildlife patches created by development can be amended through the creation or preservation of wildlife corridors (Smith et al., 2008). The provision of wildlife habitat connectivity between patches on a site is an integral part of ecological design (Smith et al., 2008). Although much of the research on habitat connectivity has been based on large scale habitat patches, many authors stress the significance of addressing connectivity of each individual site, and the use of lines of trees and shrub blocks (Barton et al.). Moreover, the number of native and non-invasive exotic plant species and the degree of vegetation layers determines the level of biodiversity in urban space (Knops et al., 1999). A tree canopy is particularly important in providing habitat for invertebrate species; whereas residential street trees providing shade can promote site biodiversity by prohibiting turf growth (Smith et al., 2008). Naturalistic styles of planting design reduce resource requirements by ease of establishment and increasing biodiversity through species variety and biomass layers.
Smith et al., (2008) promote the use of non-invasive exotics along with native plants to add biodiversity to disturbed sites where land and microclimates have been altered. The structural complexity (i.e. amount of vegetation layers) and plant species variety, rather native plant species, are key in supporting diversity and wildlife (Smith et. al., 2008). Non-invasive exotics are often more readily available in nurseries than natives, and can offer diversity to native plantings by providing habitat and shelter for wildlife. Non-native plants can also support invertebrate populations that are food sources for other wildlife with regards to local native species.

Smith et al offers the following:

- It is entirely appropriate to use local native species whenever possible in sustainable planting proposals, but this is not to say that potentially ecologically valuable, fit-for-site non-natives should be excluded, specifically in less sensitive contexts (Smith et al., 2008).

Chapter 5: Promoting Public Acceptance

Ecological Design Strategies

Encouraging the public to accept ecological design may require several strategies, including different design models. Meyer (2008) suggests a new concept known as “hyper-nature” which is described as follows:
Sustainable landscape design can reveal natural cycles, such as seasonal floods and regenerate natural processes by cleaning and filtering rainwater or replenishing soils through arrested erosion and deposition. This design model can do so as it intersects with social routines and spatial practices. This intermingling of ecological and social temporal cycles (e.g. seasonal floods and human activities) links the activities of everyday life and the unique events of a particular city to the unique and dynamic biophysical aspect of the environment. Hydrology, ecology, and human life are intertwined. A new concept known as "hyper-nature" designs with plants and materials sensitive to the place in order to magnify the surrounding contextual location and enhance our ability to appreciate the specific region in which we live. Hyper-nature has been defined as a site specific design emerging out of its context but differentiated from it (Meyer, 2008).

Ecological design techniques are not new in the field of landscape architecture, yet they are not common in urban and suburban landscapes. Examples of ecological design techniques include: increasing the size of small urban patch habitats; providing corridors for urban patches; and practicing stormwater cleaning on site (Nassauer et al., 2009). The lack of acceptance from the public of ecologically designed landscapes is often attributed to perceived community norms where there is an expectation for homeowner's yards to conform to conventional American landscape designs (Nassauer et al., 2009). Designers can bridge the gap between aesthetics and function by including identifiable signs of care and maintenance within the landscape. By incorporating culturally accepted conventions of landscape appearance and addressing characteristics of landscape beauty and ecological health, ecological designs may be publically recognized.
Designers can include these principles to enable ecological designs to appear iconic and become symbols of care, tradition, and prestige (Mozingo, 1997). Mozingo (1997) and Meyer (2008) contend that sustainable landscapes must express temporality, resiliency, and allow human interaction. Many ecological designs lack visibility, temporality, reiterated form, expression and metaphor (Mozingo, 1997). By incorporating these elements, designs will achieve a social language and order that many existing ecological landscapes lack. These elements are described as follows:

**Visibility:** Landscapes should include viewsheds, sequence, pathway, and contrast to strengthen the aesthetic experience and psychological presence of an open space (Mozingo, 1997). Current ecological design negate strong viewpoints and contrasts. Lack of visibility, contrast, and repetition of elements prevent ecological landscapes from visually blending with their surroundings to result in unclear visual patterns. Such subtlety blurs the landscape’s language and makes ecological landscapes difficult to recognize (Mozingo, 1997). The visual language of ecosystems often appears chaotic (lack of pattern) and difficult to perceive. Mozingo describes the concept of visual language as follows:

> The landscape features of ecological systems are indeed a hard read verses the easy read of an orchard. An orchard is perceptually clear from any viewpoint from within or around it. The whole system can be viewed and the origins of its existence can be perceived" (Mozingo, 1997).

Viewsheds can be improved by pathways that allow views from various angles and contrast in hardscape and plant materials improve visibility and landscape legibility.
**Temporality:** Conventional American landscapes appear static in form. A primary goal of maintenance regimes is to maintain the original design with pruning methods that make landscapes appear stationary over time. Ecological landscapes must embrace seasonality and the appearance of time because these elements are visual cues exposing the presence of the nature within ecosystems. Most conventional landscape design discourages landscape change, but biological processes are constantly fluctuating. For example, seasonal change will cause meadow flowers to die and a wetland will flood and become muddy (Mozingo, 1997).

**Reiterated form:** Mozingo (1997) asserts that many ecological landscapes appear chaotic because they lack obvious repeated form and pattern. By including form and pattern, ecological landscapes can take on aesthetic elements that people tend to accept.

The forms of ecological processes and picturesque design in Olmsted’s Central Park reveal naturalistic meadows, groves, and lakes are framed by the forms of allees, ovals, and esplanades (Mozingo, 1997).

*Anthropogenic Planting Design*

Dunnet and Hitchmough (2004) explain anthropogenic planting design as “an assemblage of species that possess evidence of fitness for a particular environment” and they promote an anthropogenic (i.e. human influences on natural systems) approach to planting design, which allows the creation of nature-like plantings that would not have originally occurred on a site. Anthropogenic planting designs typically consist of a mix of native and non-invasive exotic herbaceous perennials and shrubs. This design approach may be best suited for disturbed sites, where water flows, climate, and soils
have been altered by humans and some of the native plants that existed prior to human interference may not be as hardy as other non-invasive exotic plants (Dunnett and Hitchmough, 2004). Anthropogenic planting designs and habitat restoration have similar goals in that both seek to improve ecological health and functioning of a site. The anthropogenic approach differs from habitat restoration because it utilizes non-invasive exotics and natives mixes instead of only native plants. Anthropogenic planting designs are also highly influenced by the need for aesthetics, sustainability, sense of place, and biodiversity (Dunnett and Hitchmough, 2004).

Native plants are commonly chosen over exotic plants for ecological design because they are typically considered the most suitable providers of biodiversity and ecological benefits (Dunnett and Hitchmough, 2004). In urban settings, the exclusive use of native plants for ecological designs may not always be feasible. A limited palette of native plants may not meet design goals because not all native plants thrive under disturbed conditions, while some non-invasive exotic plants do. Native plants typically provide higher levels of biodiversity and habitat value than exotics, but exotics do support some species and can provide structure for habitat (Dunnett and Hitchmough, 2004).

Current approaches to ecological landscape design are seen in recent design practices that aspire to reflect and relate to local nature. Current ecological and naturalistic design practices can be “represented on a gradient to describe the relationship between art and nature in garden and landscape design” (Dunnett and Hitchmough, 2004). Habitat restoration is a design practice at the ‘nature’ end of the gradient, while the use of plants to provide aesthetic beauty
through color and composition is at the ‘art’ end (Dunnett and Hitchmough, 2004). The design focus of the project described in this thesis would be located in the center of the gradient, and skewed towards the ‘nature’ end.

Dunnet and Hitchmough (2004) list positions on the art/nature axis in relation to natural plant communities according to: the degree of taxonomic diversity (as opposed to monoculture) in a planted area; the degree allowed for dynamism or spatial mobility of taxa over time; the repetition of taxa over an area; and the intermingling of taxa). Six design positions are defined: 1) formality - consists typically of strict geometric forms controlled by plant spacing and rigid pruning; 2) mass planting - monocultural segments of plants with specific ecological value; 3) conventional informal planting - where no visual reflection of a natural plant community exists and plants are positioned to remain static; 4) Biotope plantings - a planting that mimics a natural plant community, but plants are chosen for their aesthetics and ecological suitability for the site’s condition; and 5) habitat restoration - the goal is to create a naturally (not altered by humans) existing habitat with solely native plants. The native species axis is represented by three levels on the gradient: 1) the use of only native plants; 2) a mix of natives and non-natives; 3) only horticultural and ornamental plants (Dunnett and Hitchmough, 2004).

Ecological design methods for the project presented here are based on the integration of biotopic planting (adding non-invasive exotics to native vegetation), where the plant palette is focused on native plants, and non-invasive exotics are included when natives do not provide aesthetic or structural requirements of the design (Dunnett and Hitchmough, 2004). The goals of biotopic planting design, along with the planting design goals of this project seek to accentuate
structural characteristics of surrounding native plant communities and context and increase biodiversity (Dunnett and Hitchmough, 2004).

Abstracting Local Character

A site analysis and inventory of user needs will enable the development of a mass/space plan that can then be used to determine the appropriate plant selection (Morrison cited in Dunnett and Hitchmough, 2004). Inventory and analysis of a site should include soil type, slopes, solar orientation, views, microclimate and existing vegetation. Factors that influence microclimate are particularly important when designing a site that reflects and incorporates a local native plant community (Morrison, 2004). For example, areas of varying shade (adjacent to structures, under trees with dense canopies), areas with high sun exposure, wet and dry locations, and climate changes that occur from season to season. Such factors will influence the types of native plants and non-invasive exotic plants used. An inventory of user needs and functional requirements will include: pedestrian and vehicular circulation, needs for screening buffering, desired uses for outdoor space (open verses shaded or enclosed spaces).

The information from the site analysis and user analysis can then be used to develop a mass/space plan (Dunnett and Hitchmough, 2004). The masses can then be used to determine where plant groupings will be placed. A plant list that matches the needs of the masses and zones will follow, and “the designation of potential community-like groupings of plants to fulfill the design criteria for different zones must be aligned with the environmental characteristics with each zone, for example, soil, moisture, slope steepness and orientation” (Morrison cited in Dunnett and Hitchmough, 2004).
Existing development most likely will create differing microclimate types that can increase the need for a range of plants used in the design (Morrison cited in Dunnett and Hitchmough, 2004).

Plant combinations that mimic contextual native plant communities should be selected in place of plant selections based solely on size, form, color, and texture (Dunnett and Hitchmough, 2004). Plants of a particular plant community grow together in nature and in combination with other species typically exhibit a pleasing aesthetic when they are grouped in a designed landscape (Dunnett and Hitchmough, 2004). Mimicking the appropriate native plant community in the designed landscape encourages sense of place, which counteracts the place-less appearance that is prevalent many designed landscapes in US cities and suburbs” (Dunnett and Hitchmough, 2004).

*Design Strategies*

Dunnett and Hitchmough (2004) suggest the following design strategies for an aesthetic, yet ecological design:

- Instead of using a single species of ground cover, mix species that have common light, water, and soil requirements. This creates redundancy, reduces the possibility of a disease or pest wiping out an entire groundcover area and provides visual variety (different textures, colors, and flowering times).

- Select species that meet the ecological and aesthetic need of the location. Stylize/abstract native plant communities by choosing a reduced group of plants from the selected plant community with the most important ecological and aesthetic characteristics for the site.
• Abstract the aesthetic composition of surrounding plant communities. Abstractions have fewer species and are located in a smaller area than the surrounding plant communities.

• Use drifts of groundcover that relate to the site’s topography or circulation. Plant to mimic patterns of vegetation found around a site, but involve existing and different species.

• Use the most suitable plants that respond to the environment. If the site is disturbed, use of non-invasive exotics that are hardier than natives and mimic the structural and aesthetic characteristics of the surrounding natural systems may is appropriate.

“Cues to Care”

Ecologically innovative landscape designs often look neglected and lack signs of care. Designs should incorporate “cues to care” – landscape patterns or looks that send a message that the landscape is cared for and intentional. Ecological landscapes designed to show cues to care can be successful compromises between ecologically healthy and publically accepted landscapes (Nassauer, 1997; Smith et al., 2008). Cues to care are visibly recognizable human maintenance processes in the landscape that show human intent and concern for landscape appearance (Nassauer, 1997). Examples of cues to care are mown lawns, trimmed shrubs and flower beds. Public acceptance and appreciation of ecologically healthy landscapes can be the deciding factor of whether or not an ecological landscape design will succeed (Smith et al., 2008). In a study by Nassauer (1995), residents rated images of seven different single-family residential landscapes on five characteristics: attractiveness, care, neatness, naturalness and need for maintenance. The
landscapes ranged from high to low ecological presence. The first landscape (high ecological value) was a typical American suburban landscape with “framed gardens” of native plantings. The last landscape (low ecological) was a typical American suburban landscape with lawn and foundation shrubs. Although suburban residents preferred the immediately recognizable conventional landscape treatment, they rated the treatment in which half of the mown lawn had been replaced with a garden of indigenous plants almost equally attractive (Nassauer 1995). The weedy lawn was rated least attractive because it looked uncared for; a look usually associated with nature. The landscape with indigenous plants framed with tidy shrub rows appeared neat and maintained, a look typically associated with a suburban landscape.

Nassauer (1995) conducted surveys in suburban neighborhoods, targeting residents with homes surrounding a national wildlife refuge, to understand people’s perceptions of wildlife habitat that were located in their own neighborhoods. Results showed that residents believed people with attractive yards were neat, cared about the environment and the neighborhood’s appearance and people who had unattractive yards did not care, had poor personality traits, or did not have the money to maintain their lawns. Terms that suburban residents used to describe attractive and unattractive landscapes related to care, such as attractiveness and naturalness. Residents described yards with a mix of natural and un-natural landscape features as attractive; yards that were considered bare and un-natural were considered unattractive; and yards described as “too wild” were typically considered unattractive. Results indicated the residents perceived landscapes that appeared maintained (visible signs of human care and upkeep), regardless of the amount of nature-like features, to be attractive and plant material types were not a factor.
In another study, Nassauer (1997) conducted surveys in several locations in the U.S. to examine landscape characteristics that people find attractive. After visiting scenic landscapes, farm lands, rural areas and suburban neighborhoods, the most significant indicators of perceived beauty related to care and neatness, including lack of litter and derelict structures, well-maintained homes with mown lawns, yards with shrubs and flowers, weed-free, evenly green, and parallel crop rows. Participants were asked to describe and locate on a map landscapes that they found attractive or unattractive. Most of the participants described the landscapes in terms of neatness, using terms such as clean, neat, no junk, things put away, mown, no weeds, messy, or weedy. Descriptors used repeatedly for attractive farmsteads were: included agricultural buildings, animals, clean, flowers and shrubs, houses, good layout, mown, no junk, no weeds, and trees. Descriptors used for attractive residents included: flowers and shrubs, lawn ornaments, architectural details, mown, neat, trees, white, and well-kept. The presence of horticultural plants as symbol of care “puts horticulture in the center of the dilemma between good intentions and disregard for biological function”. Horticultural plants make up the generally considered “neat” landscapes and neatness can result from dominant or nurturing care. The presence of horticultural plants can be cues that a landscape is well cared for. Horticultural plants can increase the range of plants that show care when native and ecologically suitable plants are placed in tidy settings that appear maintained (Nassauer, 1997).

Landscapes that are designed to improve ecological health may not be accepted by the public because they do not show human care. Nassauer’s (1995) “Cues to Care”, a culturally recognizable expression of human care and intent.
within the landscape, enables the design of publically accepted ecological landscapes. “Cues to Care” are described by the following design techniques:

- Mown strips or fencing around woodland edges and alongside paths through woodland (Gobster, 1994)
- Neatly mown strips and areas of turf alongside meadows (Nassauer, 1993)
- The incorporation of planting design rules of color composition, massing, structure, and accent plants near paths and other focal elements (Henderson et al., 1998; Nassauer, 1993; Schulhof, 1989)
- The placement of naturalistic plantings with formal planting treatments such as clipped hedges and shrubs (Henderson et al., 1998)
- Small lawn panels that are framed with native plantings, or paths. “Mowing is a part of maintenance and is often considered an act of caring for the landscape” (Nassauer, 1995)
- Integration of flowering plants and trees. Wetland and prairie plants with small flowers are often mistaken for weeds. Include a high percentage of plants with larger or showier flowers (Nassauer 1995)
- The presence of wildlife feeders and structures—bird houses and feeders are an indicator of care as birding is the number one hobby in the US (Nassauer 1995)
- Bold patterns. According to Nassauer (1995), studies have shown that people view bold patterns of strip cropping, grassy waterways and terracing with defined edges as cues to care
• Trimmed shrubs, plants in rows, linear planting designs indicate human presence and care in the landscape (Nassauer 1995); and 10
• Foundation planting. (Nassauer, 1995) found that foundation planting is highly considered by the public a visible cue to care.

Chapter 6: Design Application

Introduction

Homeowners evaluate and accept landscapes based on the level of care displayed. This cultural norm influences the appearance of landscapes in residential areas; however, biodiversity is typically decreased in these settings. The goal of this project is to create new ecological design strategies that align human aesthetic desires with ecological health requirements. Furthermore, the project provides ecological design patterns at the community and individual home scale.

Current design trends in many suburban neighborhoods exhibit housing patterns exemplified by lots of similar size and homes with similar property footprints and setbacks (Fig.12 A,B). Typical landscaping patterns within these neighborhoods reveal foundation plantings surrounding the homes, large lawns, one or two trees, and low biodiversity (Fig. 13 A, B). This current landscape norm can be transformed with different degrees of ecological design techniques. The simplest technique includes native trees forming mostly a continuous canopy along streets. A continuous canopy has the potential to increase avian and insect biodiversity and connect the neighborhood to larger peripheral habitat patches.
(Fig. 14 A, B). Next, the addition of native perimeter plantings along property lines forms a connected network of vegetation throughout the community (Fig. 15 A, B). Finally, foundation plantings provide cues to care, reduce lawn cover and add plant diversity (Fig. 16 A, B). If developers apply these designs at the community level, residents are more inclined to accept them (Nassauer et al, 2009). Developers can place these strategies in covenants with model homes demonstrating their efficacy and also ensure that the designer of the development applies them at the neighborhood and home site scale (Figs. 14-25).
Typical Housing Pattern: plan view

Typical subdivisions have a similar housing pattern.

• Lots are a similar size (spatial pattern)
• Houses have similar architecture (visual pattern)
• Setbacks have a similar depth (spatial Pattern)
Typical Housing Pattern: section view

(Fig. 12B)
Typical Landscape Pattern: plan view

Landscaping of homes in suburban communities is typically characterized by:

- Foundation planting surrounding the home
- Large lawns
- One or two trees
- Low biodiversity
Typical Landscape Pattern: section view

- lawn
- foundation planting

(Fig. 13 B)
Ecological Pattern-street trees: plan view

A new ecological pattern increases biodiversity and visual unity by including street trees in the community design.

- Native trees form a continuous canopy along streets. This canopy has the potential to increase avian and insect biodiversity; connect the neighborhood to larger peripheral habitat patches; and provide shaded areas for planting choices other than lawn.

- Line, repetition, and unity of street trees strengthen visual pattern

(Fig. 14 A)
Ecological Pattern- street trees: section view

(Fig. 14 B)
Ecological Planting- perimeter, street trees: plan view

Native perimeter plantings further strengthen the ecological pattern by increasing connectivity between street trees and vegetation along each home’s property line. Repetition of perimeter plantings promote visual unity.

- Native street trees and perimeter plantings create opportunity for less lawn
- Line, repetition, and unity of street trees and perimeter plantings strengthen visual pattern
- Native perimeter plantings provide structural layers (food and habitat) and form a connected network of vegetation throughout the community

(Fig. 15 A)
Ecological Pattern - perimeter and street trees: section view

- Green: lawn
- Yellow: street trees
- Magenta: perimeter planting

(Fig. 15 B)
Ecological Pattern- perimeter, street trees, foundation planting: plan view

The addition of foundation plantings provides “cues to care,” reduces lawn cover, and further increases plant diversity.

• Street trees and perimeter plantings create opportunity for less lawn
• Line, repetition, and unity of street trees and perimeter plantings strengthen visual pattern
• Perimeter plantings provide structural layers for wildlife food and habitat
• Perimeter plantings increase connectivity for birds and insects
• Foundation plantings provide “cues to care”, opportunity for less lawn and strengthen pattern through unity and repetition

(Fig. 16 A)
Ecological Pattern- perimeter, street trees, foundation planting: section view

(Fig. 16 B)
Individual planting zone diagrams and landscape plans for two different landscape forms are provided and include landscape designs ranging from no lawn to moderate amounts of lawn (Figs. 17-21). Plants for these plans were selected from nursery availability lists and a Florida native plant landscaping guide based on natural communities found in Alachua County (Fig. 22 A-C). Each design is based on accepted cues to care that meet cultural norms of landscape aesthetics. This enhances individual and community acceptability (Nassauer, 1997).
Planting Zones: Moderate Lawn/Curvilinear Form

Trees, Shrubs and Groundcover
A: gradation of planting heights strengthens visual interest and views from the home.
- plant variety provides various colors and textures.
E: - plant variety and gradation of plant heights provide wildlife habitat and food.
F: - trees provide shade.
- plant variety has a cooling effect.

Trees and Shrubs
A: gradation of planting heights provide visual interest
E: - layers provide food an habitat for wildlife
F: - shades pathways and home

Lawn
A: - provides an open viewshed
E: - stabilizes soil
F: - provides an open area for activities

Shrubs
A: - frame terrace
- conventional foundation planting
E: - shrub layers offer wildlife habitat and food.
F: - offers opportunity for planting choices other than lawn.

Entrance Planting
A: - repition of plants in a linear form provides visual pattern and order for entrance.
E: - layers provide food an habitat for wildlife
F: - trees shade entrance
- tree and shrub cover provides planting choices other than lawn
"Cues to Care" (Nassauer, 1995)

**Overall Landscape features**
- Plant selection displays seasonal color and interest
- Structured, lawn panels and pathways organize and contrast plant beds.
- A diverse, plant palette provides structural layers (habitat) and food sources for birds and insects.
- Plants are grouped into overlapping masses to form a bold pattern.

**Front yard**
- Lawn panels provide a traditional, maintained landscape feature and contrast taller plantings.
- Plant masses are blocked into overlapping patterns.
- Traditional foundation planting surrounds the home.

**Side yards**
- Wildflowers and groundcovers are grouped into blocks to make meager foliage appear denser.
- Linear pathways organize plant beds.

**Back yard**
- Lawn panels provide a traditional, maintained landscape feature; contrast taller plantings; provide a structure from which to organize plant beds and a functional area for homeowners and children.
- Tree groupings provide seasonal color.
- Wildflowers and groundcovers are grouped into blocks to make meager foliage appear denser.
Planting Zones: No Lawn/Curvilinear Form

**Trees, Shrubs and Groundcover**
- Gradation of planting heights strengthens visual interest and views from the home.
- Plant variety provides various colors and textures.
- Plant variety and gradation provide wildlife habitat and food.
- Trees provide shade, plant variety has a cooling effect.

**Groundcovers**
- Provide color and various textures and interesting views from outdoor seating areas.
- Appeal to different types of wildlife.
- Offer opportunity for planting choices other than lawn.
- Provide various viewing angles from path.

**Entrance Planting**
- Repetition of plants in a linear form provides visual pattern and order for entrance.
- Layers provide food and habitat for wildlife.
- Trees shade entrance.
- Tree and shrub cover provides planting choices other than lawn.

**Trees and Shrubs**
- Gradation of planting heights provide visual interest.
- Layers provide food and habitat for wildlife.
- Shade pathways and home.

A= aesthetic function
E= ecological function
F= overall function
No Lawn/ Curvilinear Form

“Cues to Care” (Nassauer, 1995)

Overall Landscape features
- plant selection displays seasonal color and interest
- pathways act as spatial organizing elements
- provide a structure (form and pattern) from which to organize plant beds; allow user interaction; and
- set up a variety of views within the landscape
- overlapping masses of plant material create bold patterns
- a diverse plant palette provides structural layers (habitat) and food sources for birds and insects

Front yard
- wildflowers and groundcovers are grouped in blocks to make meager foliage appear denser
- plant masses are blocked into overlapping patterns
- traditional foundation planting surrounds the home

Side yards
- wildflowers and groundcovers are grouped in blocks to make meager foliage appear denser
- pathways organize plant beds

Back yard
- tree groupings provide seasonal color
- wildflowers and groundcovers are grouped in blocks to make meager foliage appear denser.
Planting Zones: Moderate Lawn/Rectilinear Form

Trees, Shrubs and Groundcover
- gradation of planting heights strengthens visual interest and views from the home.
- plant variety provides various colors and textures.
E: plant variety and gradation of plant heights provides wildlife habitat and food.
F: -trees provide shade.
- plant variety has a cooling effect.

Trees and Shrubs
- gradation of planting heights provide visual interest
E: -layers provide food an habitat for wildlife
F: -shade pathways and home

Entrance Planting
- repetition of plants in a linear form provides visual pattern and order for entrance.
E: -layers provide food an habitat for wildlife
F: -trees shade entrance
- tree and shrub cover provides planting choices other than lawn

Lawn
A: provides an open viewshed
E: stabilizes soil
F: provides an open area for activity

A = aesthetic function
E = ecological function
F = overall function

(Fig. 19a)
"Cues to Care" (Nassauer, 1995)

Overall Landscape features
- Plant selection displays seasonal color and interest
- Structured, linear lawn panels and pathways organize and contrast plant beds
- Plants are grouped into overlapping masses to form a bold pattern
- Linear landscape features (pathways, plant beds, lawn panels) repeat the home’s modern (linear) architecture
- A diverse plant palette provides structural layers (habitat) and food sources for birds and insects

Front yard
- Lawn panels provide a traditional, maintained landscape feature and contrast taller plantings
- Tidy linear plantings display structure and order
- Traditional foundation planting surrounds the home

Side yards
- Messy native plants are framed with tidy shrub rows
- Wildflowers and groundcovers are grouped in blocks to make meager foliage appear denser
- Linear pathways organize plant beds

Back yard
- Lawn panels provide a traditional, maintained landscape feature, contrast taller plantings, and provide a structure from which to organize plant beds
Planting Zones: Small Lawn/Rectilinear Form

Trees, Shrubs and Groundcover
A: -gradation of planting heights
  -strengthens visual interest and views from the home.
  -plant variety provides various colors and textures.
E: -plant variety and gradation of plant heights provides wildlife habitat and food.
F: -trees provide shade.
  -plant variety has a cooling effect.

Groundcovers
A: -provide color and various textures and interesting views from outdoor seating areas
E: -appeal to different types of wildlife
F: -offer opportunity for planting choices other than lawn.
  -provide various viewing angles from paths

Entrance Planting
A: -repetition of plants in a linear form
  -provides visual pattern and order.
E: -layers provide food an habitat for wildlife
F: -trees shade entrance
  -tree and shrub cover provides planting choices other than lawn

Trees and Shrubs
A: -gradation of planting heights
  -provide visual interest
E: -layers provide food an habitat for wildlife
F: -shade pathways and home

Lawn
A: -provides an open viewshed
E: -stabilizes soil
F: -provides an open area for activity

A= aesthetic function
E= ecological function
F= overall function
Small Lawn/Rectilinear Form

“Cues to Care” (Nassauer, 1995)

Overall Landscape features
- plant selection displays seasonal color and interest
- straight linear pathways organize and contrast plantings, provide viewscreens, and allow user interaction
- a diverse, native plant palette provides structural layers (habitat) and food sources for birds and insects
- plants are grouped into overlapping masses to create a bold pattern
- repeated pathways in front and back yards unite the landscape and create pattern

Front yard
- mown strips/lawn panels provide a traditional, maintained landscape feature
- tidy linear plantings display structure and order
- traditional foundation planting surrounds the home

Side yards
- messy plants are framed with tidy shrub rows
- wildflowers and groundcovers are grouped in blocks to make meager foliage appear denser

Back yard
- small groupings of flowering trees provide seasonal color
- messy native plants are framed with tidy shrub rows
- wildflowers and groundcovers are grouped in blocks to make meager foliage appear denser
(Fig. 21)
Xeric Landscaping with Florida Native Plants

(Fig. 22 A) (AFNN, 1991)
Acid soils are sandy with some peat, but generally low in organic material, and are usually underlain by an impervious hardpan or clay layer, one to three feet below the surface. Moisture levels fluctuate yearly from very dry to nearly saturated or inundated for long periods in the growing season. Under natural conditions fires occur at five to ten year intervals, preventing hardwood succession. Flatwoods plants tolerate a wide range of moisture and soil fertility levels. They are generally not tolerant of salt, shaded or alkaline soils. Dry prairie is very similar to flatwoods but lacks the pine Ordovician. Wet prairies occasionally intersingle with fine flatwoods forming a wetland mosaic.

2) PINE FLATWOODS

Shrubs:
- Hypericum fasciculatum
- Hypericum hyperosideae
- Ilex glabra
- Ilex myrtifolia
- Leucodermis racemos
- Lyonia fruticosa
- Lyonia ligustrina
- Lyonia lucida
- Parthenocissus quinqufolia
- Vaccinium arboreum
- Vaccinium coromandelianum
- Vaccinium decoguina
- Vaccinium myrtillus
- Viburnum nudum

Groundcovers:
- Andropogon aureus
- Andropogon virginicus
- Arctium minus
- Dichomoena spp.
- Eriocaulon spp.
- Lactucastris caroliniana
- Melianthus major
- Nolita nobilis
- Oryzopsis elata
- Schizachrynymus spp.
- Sorgamus grandiflorus
- Woodwardia virginica
- Zamia poensis

Vines:
- Geranium sanguineum
- Vitis rotundifolia

Canopy trees:
- Pinus elliottii
- P. palustris
- P. serotina

Understory trees:
- Dahoon holly
- Redbay

Shrub understory:
- Poaceae
- Asterina procera
- Baccharis glutiniflora
- Betula nigra
- Callicarpa americana
- Callicarpa simonita
- Cryptomeria japonica
- Cyrtis racemosa

North Florida

Shrubs:
- St. John's wort
- St. John's wort
- Gallberry
- Myrtle daleen
- Frenchbush
- Snagbark
- Maple
- Fernbush
- Wax myrtle
- Okechobee bayberry
- Fever tree
- Chapman Rhododendron
- Hammocksweet azalea
- Shining sumac
- Saw palmetto
- Muscadine grape
- Highbush blueberry
- Dwarf blueberry
- Shiny blueberry
- Postage stamp

Groundcovers:
- Silver bluegrass
- Simple growth
- Wiregrass
- Star russ
- Bog buttons
- Redroot
- Marsh grass
- Bear grass
- Cinnamon fern
- None
- Lop-sided indigo grass
- Nested chain fern
- Cocoon

Vines:
- Carolina jessamine
- Muscadine grape

Wildflowers:
- Sagittaria
- Wild hazelhose
- Bluets
- Deer tongue
- Blue mist flower
- Tickleweed
- Queens-of-the-meadow
- Flat-topped goldenrod
- Sawweedy
- Narrow-leaf sunflower
- Bayless sandflower
- St. John's wort
- Bay blue flag
- Blazing star
- Fine myrtle
- Sundrops
- Heuchera
- Obedient plant
- False dragonhead
- Golden aster
- Camphor weed
- Muskwood heath
- Coreopsis

(Fig. 22 B) (AFNN, 1991)
77

(Fig. 22 C)(AFNN, 1991)
(Fig. 22 D-E)

(AFNN, 2008)

(Plantfinder, 2010)
Conclusion

The goal of this project was to create new ecological design strategies that align human aesthetic desires with ecological health requirements. Furthermore, the project provided ecological design patterns at the community and individual home scale. New ecological design models for subdivision communities guide design processes by reducing the environmentally destructive patterns of sprawl and the consequent loss of nature. Additionally these models incorporate design objectives that address landscape aesthetics for the purpose of public acceptance and recognition. New ecological design models can change landscape norms within new suburban communities by incorporating new planting patterns. Landscape design decisions made at the site level have direct contact and connection with larger scales. By incorporating new models of design in suburban communities, ecological landscape design can play a critical role in uniting fragmented places, restoring damaged natural systems and improving overall sense of place.

Ecological landscape design models consisting of foundation plantings, perimeter plantings (i.e. vegetative layers of trees, shrubs and groundcovers along property boundaries) and street trees offer the most benefits in terms of improving biodiversity; connecting communities to larger surrounding habitat patches; reducing resource use; and strengthening overall landscape aesthetic patterns through unity, line, repetition, and visual cues to care. An ecological landscape design model consisting of only perimeter plantings and street trees offers similar benefits. However, lack of foundation plantings may eliminate conventional community norms. The simplest technique includes native trees forming a continuous canopy along streets. A continuous canopy has the potential to increase avian and insect biodiversity and
connect the neighborhood to larger peripheral habitat patches. Additionally individual homeowners can extend the ecological design model by decreasing lawn area and increasing plant diversity. The implementation of cues to care that meet cultural norms of landscape aesthetics may bolster acceptance of these designs. People are highly influenced by the types of landscapes that they see repeated within their community. If developers apply these techniques at the community scale then a new ecological landscape pattern can be created.
Bibliography


2009 Florida Statutes; Title XXVII Natural resources; Conservation, Reclamation and Use. Chapter 373: Water Resources. 373.183 Local Florida –friendly landscaping ordinances. <http://www.leg.state.fl.us/>


The Importance of Aesthetics in Ecological Design Patterns for Residential Neighborhoods

Kelly Perez
Can ecological design and landscape aesthetics be reconciled?

- My experiences
- Landscape aesthetic
- Ecology and scale
- Landscape patterns
- Ecological design
- Rationale and design applications
My appreciation of nature

www.panoramio.com/photo/591609
Listening to client desires in terms of plant material
Challenges with current suburban landscapes
What drives landscape choices?

- **Landscape Aesthetics**
  - Prospect/Refuge
  - Picturesque Movement
  - 17\textsuperscript{th} Century landscape paintings

(Jorgensen, 2004)
What drives landscape choices within the built environment?

- Cultural norms - internalized beliefs about what other people feel
- Cues to care - landscape appearances that send a message that the landscape is cared for and intentional

http://www.treehugger.com/push-mowe
http://pnwmg.org/images/
Conventional landscape practices
Perceiving landscapes at the human scale

- Life occurs at various scales
- Humans interact with the environment at a particular scale— the “human perceptible realm” (Gobster et al. 2008)

http://ndnforum.com/blogs/
http://yourhomegardenblog.com
http://www.fs.fed.us/
Developing interventions based on the human perceptible realm

• Human interaction with the landscape can cause landscape change
  • Our desired experiences = + or – landscape change
• Design Interventions for + experience and increased ecological health

Tallamy, 2007
Pattern in the built form

• can provide insight on how to design for positive aesthetic experiences and at the same time promote healthier ecological processes

• is often used to create overall visual order and unity.
Pattern

• is typically expressed when repeated elements are organized in a recognizable sequence

• Unity, line, and repetition are design elements that create pattern.
Pattern

- **Unity**: relationship between all design elements
- **Repetition**: moves the eye across visual motifs of a design
- **Line**: forms all shapes and direct the eye to the edges of the form

(Smith, 2003)
Typical Housing Pattern: plan view

Typical subdivisions have a similar housing pattern.

• Lots are a similar size (spatial pattern)
• Houses have similar architecture (visual pattern)
• Setbacks have a similar depth (spatial Pattern)
Native perimeter plantings further strengthen the ecological pattern by increasing connectivity between street trees and vegetation along each home’s property line. Repetition of perimeter plantings promote visual unity.

- Native street trees and perimeter plantings create opportunity for less lawn
- Line, repetition, and unity of street trees and perimeter plantings strengthen visual pattern
- Native perimeter plantings provide structural layers (food and habitat) and form a connected network of vegetation throughout the community
Ecological Landscape Design

• *ecological landscape design approach*: “creates landscapes that form human-scaled ecosystems, while at the same time respecting the natural world” (Crewe and Forsyth, 2003)

• designed plantings that are structured around natural plant communities specifically for enhancing biodiversity
Importance of Ecological Landscape Design

- Mitigate problems with:
  - Rapid development
  - Rapid loss of habitat
  - Reduce resource intensive landscape practices
  - Help connect isolated patches created by development with small wildlife corridors

Tallamy, 2007
Ecological Landscape Design

• This project stresses small scale connectivity of each individual site
  • lines of trees and shrub blocks (Barton et al., 1995)
    – Tree canopies provide habitat for invertebrate species
  • Adding vegetation layers with native and non-invasive exotic plant species increases the level of biodiversity (Knops et al., 1999)
Use of Native Plants in Ecological Landscape Design

- 37% of all animal species are herbivorous insects (bird food)
- Native plants and native insects adapted to their indigenous habitat over long periods of time.
- Many native insects do not eat alien plants because of the long time required to adapt to the novel chemical composition of alien plants

Tallamy, 2007
Rationale

• **Project Rationale:** bridge the gap between ecological needs and cultural expectations of a socially acceptable landscape aesthetic.

• **Objective:**
  – combine landscape design and landscape aesthetic preferences to create design patterns that meet societal aesthetic preferences at the neighborhood and home site scales.
Design Applications at the Neighborhood Scale
Typical Housing Pattern: plan view

Typical subdivisions have a similar housing pattern.

• Lots are a similar size (spatial pattern)
• Houses have similar architecture (visual pattern)
• Setbacks have a similar depth (spatial pattern)
Typical Housing Pattern: section view

lawn
Landscaping of homes in suburban communities is typically characterized by:

• Foundation planting surrounding the home
• Large lawns
• One or two trees
• Low biodiversity
Typical Landscape Pattern: section view

- lawn
- foundation planting
A new ecological pattern increases biodiversity and visual unity by including street trees in the community design.

• Native trees form a continuous canopy along streets. This canopy has the potential to increase avian and insect biodiversity; connect the neighborhood to larger peripheral habitat patches; and provide shaded areas for planting choices other than lawn.

• Line, repetition, and unity of street trees strengthen visual pattern
Ecological Pattern- street trees: section view

- lawn
- street trees
Native perimeter plantings further strengthen the ecological pattern by increasing connectivity between street trees and vegetation along each home’s property line. Repetition of perimeter plantings promote visual unity.

- Native street trees and perimeter plantings create opportunity for less lawn
- Line, repetition, and unity of street trees and perimeter plantings strengthen visual pattern
- Native perimeter plantings provide structural layers (food and habitat) and form a connected network of vegetation throughout the community
Ecological Pattern - perimeter and street trees: section view

- **lawn**
- **street trees**
- **perimeter planting**
The addition of foundation plantings provides “cues to care,” reduces lawn cover, and further increases plant diversity.

- Street trees and perimeter plantings create opportunity for less lawn
- Line, repetition, and unity of street trees and perimeter plantings strengthen visual pattern
- Perimeter plantings provide structural layers for wildlife food and habitat
- Perimeter plantings increase connectivity for birds and insects
- Foundation plantings provide “cues to care”, opportunity for less lawn and strengthen pattern through unity and repetition
Ecological Pattern- perimeter, street trees, foundation planting: section view

- **lawn**
- **street trees**
- **perimeter planting**
- **foundation planting**
Design Applications at the Individual Home Scale
Cues to Care

- *Definition*: identifiable signs of care and maintenance within the landscape.

Nassauer, 1995
Cues to Care

• The placement of naturalistic plantings with formal planting treatments such as clipped hedges and shrubs
• Small lawn panels that are framed with native plantings, or paths.
• Integration of flowering plants and trees
• Bold patterns
• Trimmed shrubs, plants in rows, linear planting designs

(Nassauer, 1995)
Plant Palette

- Native plants were selected based on local plant communities occurring in Alachua County, suitability, and nursery availability.
- Non-invasive exotic plants were selected based on site suitability.

(AFNN, 2007)

www.afnn.com
www.plantfinder.com
Moderate Lawn/ Rectilinear Landscape Form

integration of flowering plants and trees
lawn panel
messy plantings are organized with linear pathways
linear pathways organize plant beds
foundation planting
linear planting patterns
blocks/drifts of native groundcovers make meager foliage appear denser

“Cues to Care” (Nassauer, 1995)

Overall Landscape features
- plant selection displays seasonal color and interest
- structured, linear lawn panels and pathways organize and contrast plant beds.
- plants are grouped into overlapping masses to form a bold pattern
- linear landscape features (paths, plant beds, lawn panels) repeat the home’s modern (linear) architecture
- a diverse plant palette provides structural layers (habitat) and food sources for birds and insects

Front yard
- lawn panels provide a traditional, maintained landscape feature and contrast taller plantings
- tidy linear plantings display structure and order
- traditional foundation planting surrounds the home

Side yards
- messy native plants are framed with tidy shrub rows
- wildflowers and groundcovers are grouped in blocks to make meager foliage appear denser
- linear pathways organize plant beds

Back yard
- lawn panels provide a traditional, maintained landscape feature, contrast taller plantings, and provide a structure from which to organize plant beds
“Cues to Care” (Nassauer, 1995)

Overall Landscape features
- plant selection displays seasonal color and interest
- pathways acts as spatial organizing elements provide a structure (form and pattern) from which to organize plant beds; allow user interaction; and set up a variety of viewsheds within the landscape
- overlapping masses of plant material create bold patterns
- a diverse plant palette provides structural layers (habitat) and food sources for birds and insects

Front yard
- wildflowers and groundcovers are grouped in blocks to make meager foliage appear denser
- plant masses are blocked into overlapping patterns
- traditional foundation planting surrounds the home

Side yards
- wildflowers and groundcovers are grouped in blocks to make meager foliage appear denser
- pathways organize plant beds

Back yard
- tree groupings provide seasonal color
- wildflowers and groundcovers are grouped in blocks to make meager foliage appear denser.
Conclusion

New ecological design models

• guide design processes by reducing the environmentally destructive patterns of sprawl and the consequent loss of nature.

• incorporate design objectives that address landscape aesthetics for the purpose of public acceptance

• By incorporating new models of design in suburban communities, ecological landscape design can play a critical role in uniting fragmented places and restoring damaged natural systems.