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**Linking Intermountain West Shrub-Steppe Grassland Restoration Ecology With Cultural Meaning Through Landscape Design**

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LINKING INTERMOUNTAIN WEST SHRUB-STEPPE GRASSLAND
RESTORATION ECOLOGY WITH CULTURAL MEANING
THROUGH LANDSCAPE DESIGN

by

Bridget M. Atkin

A project submitted in partial fulfillment
of the requirements for the degree
of
MASTER OF LANDSCAPE ARCHITECTURE

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Logan, Utah

2013
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ABSTRACT

Linking Intermountain West Shrub-Steppe Grassland Restoration Ecology with Cultural Meaning through Landscape Design

by

Bridget M. Atkin, Master of Landscape Architecture

Utah State University, 2013

Major Professor: Caroline Lavoie
Department: Landscape Architecture and Environmental Planning

It has been proposed that the aesthetic quality of landscapes, designed or natural, provides a critical linkage between humans, and ecological processes and function. Ecological function is not always compatible with cultural expectations of the landscape aesthetics or is considered desirable. This thesis argues that landscapes that demonstrate desirable environmental characteristics can also possess aesthetic qualities. If they are well-utilized by the general population and more valuable ecologically, they will be more successful. This thesis examines the use of principles of landscape design to incorporate meaningful ecological function within a constructed landscape with desirable aesthetics for the mutual benefit of human and non-human inhabitants.

One approach to achieving harmony between ecological function and culturally accepted aesthetic character is through the use of regionally appropriate, native plant
community-based garden designs. This approach has potential applications in many urban and suburban settings, including remnant natural areas, urban and suburban parks, commercial campus developments, school grounds, and residential areas. The concept of creating native landscapes within urban and suburban areas is explored as an alternative to turf and non-native shade tree landscapes that dominate urbanized areas in the Intermountain West as they do elsewhere. The work of prominent landscape designers from various periods in history is reviewed to describe their influences on landscape perceptions and cultural values as expressed in their writings and designs.

The thesis presents three different designs that explore, compare, and critique different design approaches for a parcel of land that is being developed as part of the Utah Botanical Center (UBC) in Kaysville, Utah. Two of these approaches reference or seek to recreate the shrub-steppe grassland habitat that is characteristic of the Intermountain West within the confines of the particular design approach paradigm.

The site was selected, in part, because the location is characteristic of the highly developed valley floors that interface with grassland shrub-steppe-dominated foothills bordering the Wasatch Range. The formal English-style design approach has a long history and continues to reflect cultural ideals that are commonly held and expressed in urban and suburban landscapes in the study area. The second naturalistic or informal restoration design applies landscape restoration principles and current restoration science for grassland shrub-steppe plant communities in the Intermountain West with minimal concern for cultural linkages. Finally, the third design expression, the artistic restoration design, integrates restoration science with design elements and principles. This final design expression is founded on ecological principles and an understanding of the natural
history of the site within a framework of culturally accepted classic or formal design structure.

Each design approach was evaluated and rated using the Society for Ecological Restoration (SER) assessment protocol, and the assessments were used to compare the three designs. This thesis argues that the approach that combines ecological principles with classical and naturalistic elements can create a more meaningful experience for users while integrating ecological value within a built environment that incorporates a native plant community structure as a guiding template for design decisions.
PUBLIC ABSTRACT

Linking Intermountain West Shrub-Steppe Grassland Restoration Ecology with Cultural Meaning through Landscape Design
Bridget M. Atkin

It has been proposed that the aesthetic quality of landscapes, designed or natural, provides a critical linkage between humans, and ecological processes and function. Ecological function, or a healthy environment, is not always compatible with people’s expectations of what makes a landscape beautiful. This thesis argues that landscapes that are ecologically beneficial can also be beautiful, and in turn, be readily accepted by the general population to be more valued, used, and therefore more successful. This thesis examines how the uses of the principles of landscape design (e.g. line, color, form, texture, variety, repetition, emphasis) can be incorporated to create meaningful ecological function within a constructed landscape for the mutual benefit of human and non-human life by incorporating aesthetic components with significant ecological value.

One approach to achieving harmony between ecological function and culturally accepted aesthetic character is through the use of regionally appropriate, native plant community-based garden designs. This approach has potential applications in many urban and suburban settings including remnant natural areas, urban and suburban parks, commercial campus developments, school grounds, and residential areas. The concept of creating native landscapes within urban and suburban areas is explored as an alternative to turf and non-native shade tree landscapes that dominate urbanized areas in the Intermountain West and elsewhere. The work of prominent landscape designers from various periods in history are reviewed to describe their influences on landscape perceptions and cultural values as expressed in their writings and designs.

The thesis presents three different designs that explore, compare, and critique landscaping approaches for a parcel of land that is being developed at the Utah Botanical Center (UBC) in Kaysville, Utah. Two of these approaches reference or seek to recreate the shrub-steppe grassland habitat that is characteristic of the Intermountain West, within the confines of each design paradigm.

The site was selected, in part, because the location is characteristic of the highly developed valley floors that interface with grassland shrub-steppe-dominated foothills bordering the Wasatch Range. The formal English design approach has a long history, yet it continues to reflect cultural ideals that are commonly held and expressed in urban and suburban landscapes in the study area. The second naturalistic or informal design applies landscape restoration principles and current restoration science to grassland shrub-steppe plant communities in the Intermountain West, with minimal concern for cultural linkages. Finally, the third design expression, the artistic restoration design, integrates ecological restoration science with design elements and principles. This final design expression is based on an understanding of the natural history of the site within a framework of culturally accepted classic, formal design structure.
Each design approach was evaluated and rated using the Society for Ecological Restoration (SER) assessment protocol so the three designs could be compared. This thesis argues that the most meaningful experience for users is created by using elements with ecological value, such as native plants, within a familiar naturalistic design aesthetic.
ACKNOWLEDGMENTS

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Bridget M. Atkin
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CHAPTER I
INTRODUCTION

Humans have shaped the landscape they occupy for functional as well as aesthetic value, but this practice has sometimes adversely impact the environment. Almost all acts of design have qualitative (e.g. descriptive qualities or characteristics that cannot be measured with a numerical result) environmental impacts on the world (Eckbo, Sullivan, Hood & Lawson, 1998). Common land use practices (e.g., agriculture, grazing, residential and commercial development) have been adopted and applied, sometimes indiscriminately, on landscapes throughout the United States. These practices, particularly in the western United States, often compete for limited natural resources, especially water. With recognition of cultural and environmental losses represented by degraded landscapes, we can increase opportunities to restore these landscapes using methods that are ecologically sound and culturally meaningful.

Disconnections between conserving or creating ecological function and designing publically acceptable landscapes are common. It is challenging to synthesize an approach with sound ecological function and structure that also incorporates culturally accepted aesthetic attributes for public and private spaces. As an example, the routine use of a culturally popular and ecologically dysfunctional element such as bluegrass turf is also driven by product availability and familiarity with the required maintenance approaches (e.g., fertilization, herbicide treatment and mowing). In contrast, areas that are fully ecologically functional are generally considered less suitable for most public or
personal uses. Thus, restoring disturbed landscapes or creating new parks or other public places using ecological concepts and native plants is challenging.

The purpose of this thesis was to develop alternative approaches to the restoration of disturbed landscapes that integrate, to the extent possible, ecological function, structure and process, human use, and basic design principles. This thesis argues that the gap between aesthetics and ecological function can be bridged by combining the design elements and principles described by Dee (2001), Ching (1996), and Booth (1990), the design approaches developed by Naussauer (1988, 1995a, 1995b, 1997), Williams and Cary (2001), and Gobster, Nassauer, Daniel & Fry (2007), and appropriate ecological considerations (Falk, Palmer, & Zedler, 2006; Alberti, 2005; SER, 2004) to create a landscape that is culturally valued while contributing to the larger ecological network in which it resides. In this study, the synthesis and application of these approaches to urban landscapes are specific to the landscape ecology of the Intermountain West.

Directors of the Utah Botanical Center (UBC), a public botanical center located in Kaysville, Utah that is administered by Utah State University, envisioned a landscape design that embodied the ecology of the region while catering to the educational, recreational and aesthetic needs and expectations of surrounding communities. To illustrate the bridging of ecology and aesthetics in this thesis, a site at the UBC was selected as a case study. The site selected is characteristic of the highly developed valley floors that interface the foothills bordering the Wasatch Range. The three design expressions discussed here were explored and developed for this site and are discussed here as alternatives that all meet the needs of this public space while creating cohesion between a meaningful cultural aesthetic and providing ecological value.
Throughout the course of history, prominent landscape designers established landscape concepts and design expressions that recognized an aesthetic that expressed the cultural values of the time. These iconic designers from the past and present influence our perception of and response to both natural and designed landscapes. This thesis is divided into four chapters. Chapter II examines the evolution of the ideas and their expressions in art that, along with innate landscape preferences, have influenced human landscape preferences and perceptions. It includes a discussion of the development of design approaches and key concepts used in contemporary design. These concepts have evolved over time to consider and incorporate, to the extent possible, a site’s predisposed ecological potential into the design expression. This chapter concludes with an examination of the formation of linkages between ecologically functional landscapes and aesthetic preferences through the use of concepts such as “cues to care” (Nassauer 1995b) and the arranging of ‘native’ landscape elements for greater acceptance of ecologically based landscape design.

It is important to understand the fundamental components of ecosystem restoration prior to undertaking a design. This knowledge allows designers to recognize and prioritize important elements that are required for a healthy landscape. Chapter III describes the concept of “ecological restoration” as defined by ecologists. This chapter discusses the critical elements found in successfully restored ecosystems, and the importance of using native systems as inspiration in the design of ecologically responsive large (e.g., parks and degraded natural areas) and small (e.g., residential) landscapes.

Humans have strong inclinations toward particular landscape features. These do not always align with creating environments that promote ecological health. Chapter IV
examines the relationships among human landscapes (i.e., human-dominated ecosystems such as urban and suburban areas), cultural preferences, the natural environment, and our perception of nature, and examines how those perceptions influence the way humans use and treat the environment. This chapter also includes a discussion of preferred landscape characteristics as well as the human health benefits of intact and healthy ecosystems. In addition, the use of an ecological or environmental aesthetic, such as the increased appreciation of the characteristics of a native ecosystem, is discussed as a means of improving the perceived value of landscapes that retain ecological function.

By considering the interaction of cultural preference with different approaches to incorporating ecological function into landscapes dominated by humans, Chapter V seeks to contrast the likely success, culturally and ecologically, of the proposed three design undertakings. Landscape elements native to the Intermountain West (such as individual plant species and plant communities) are combined with design elements to formulate design expressions that create ecological and cultural meaning that are generally acceptable. Each landscape design expression uses a different focus and was applied to the selected site. These design expressions present distinct design characteristics, which include: 1) an English-style design approach, 2) a native restoration approach that is scientifically based, and 3) an integration of the first two into an “artistic” restoration to maximize familiar cultural preferences without compromising ecological restoration goals. A comparison of these designs illustrate that a cohesive synthesis can be achieved by thoughtfully integrating cultural and aesthetic considerations with ecological principles.
CHAPTER II
EVOLUTION OF PHILOSOPHICAL APPROACHES
TO LANDSCAPE DESIGN

Introduction

Our current concept of a well-designed landscape is derived from a combination of ideals introduced by various landscape architects throughout history, as interpreted through the lens of our time and culture. These ideals have had a far-reaching effect on perceived aesthetic values as well as profound environmental implications. Their implementation influences current design process and results in landscapes typical of the early 21st Century.

Although the term “landscape architecture” was coined in by Frederick Law Olmstead in the nineteenth century, this chapter examines the design approaches and motivations of influential landscape designers and landscape architects from the eighteenth century until the present, to inform our understanding of the current relationship between humans and nature as embodied in the field of landscape architecture and design. Key elements from Lancelot “Capability” Brown’s design methodology can be seen in many traditional and more formal landscapes today. The smooth, gentle lines created by broad views of lawn became popular in the mid-1700s. Brown’s design approach was rejected by Uvedale Price and Richard Payne Knight, who moved the practice toward the rugged and untamed Picturesque Style in the late-1700s (Rogers, 2001). Eventually, Andrew Jackson Downing introduced a more moderate
approach of design in the mid-1800s that mixed romantic elements with English
countryside pastoral (Rogers, 2001). Jens Jensen popularized a design approach in the
eyear 1900s that linked native prairie plants with elements of earlier design approaches
and subsequent designers of the Picturesque period (Greese, 1992). In more recent times,
Ian McHarg developed large-scale conservation strategies by emphasizing consideration
of natural resources and ecologically natural processes and systems in the 1960’s
(Rogers, 2001; McHarg, 1969). Although, McHarg’s approaches dealt with large scale
issues, his influence in the 1940’s affected site designers as well. Garrett Eckbo’s work,
from the 1940’s to the 1970’s focused on integrating indoor and outdoor living in the
home landscape, while George Hargreaves’ work, which began in the late 1980’s, has
focused on facilitating human interaction with nature by designing natural parks on a
more moderate scale (Eckbo, 1950, 1956, 1998). More recently, Wolfgang Oehme and
James van Sweden (1998) focused on the use of a richly diverse native plant palette in
artistically structured designs. Andropogon Associates (2008), a landscape architecture
firm located in Philadelphia, Pennsylvania, anchors their design approach with ecological
principles and restoration with limited concern for aesthetics. Within the span of
approximately 200 years of practice in landscape design, limited concerns with the purely
aesthetic have been tempered by the integration of ecological priorities. As seen in these
descriptions, the design priorities have moved from a superficial reconstruction of the
appearance of natural landscapes to one that incorporates an understanding of ecological
process.
Design Philosophies of Keystone Landscape Designers

Elements from design philosophies and aesthetic ideals proposed by Lancelot “Capability” Brown (1716-1783) continue to have far-reaching effects in landscape architecture. Brown’s style embraced smooth, gently undulating expanses of lawn and simplified palates of plants. Brown’s style was composed of “harmonious, naturalistic configurations” introducing a tamed perspective of nature that contrasted with perceptions of wild, untamed places (Rogers, 2001). Rogers also pointed to Brown’s use of the element of suspense to enhance the landscape experience through carefully placed groups of trees and sweeping, uninterrupted views to focal points, which in many cases was a large residence (Figure 1).

Brown used topography to form a series of gentle convex and concave curves, meeting a level plane comprised of lawn and water. The broad lawn expanses and simplified

Figure 1. Aesthetic of Lancelot “Capability” Brown. Brown’s designs were characterized by smooth undulating expanses of lawn with clean lines and scattered trees to accentuate depth and perspective
planting palates in landscapes one can see today that include nothing extraneous to conceal the residence are reminiscent of Brown’s style.

The Picturesque style, which evolved later, was distinguished from Brown by rugged, varied sceneries that included rough and smooth elements within a landscape composition. According to Rogers (2001), designers of that school, such as Uvedale Price (1747-1829) and Richard Payne Knight (1750-1824), were contemptuous of Brown’s clumps, shaven lawn, and serpentine streams. They embraced the richer and more robust stylistic interpretation of nature that the Picturesque Style embodied (Figure 2). In *On the Picturesque* (1796), Price states,

Natural groups … are full of openings and hollows; of trees advancing before, or retiring behind each other; all productive intricacy, and of variety, of deep shadows and brilliant lights. The other [clumps] are lumps. In walking about a natural group, the form of it changes at each step; new combinations, new lights and shades, new inlets, present themselves in succession. (p. 268).

*Figure 2. Picturesque style.* The picturesque style created a rugged, stylistic interpretation of nature with thickets of brush and old, gnarled trees.
Eventually, a tempered version of nature arose among other designers. Andrew Jackson Downing (1815-1852) was a student during the Picturesque style period, utilizing the associated characteristics to “preserve the illusion of living in nature;” in landscapes rapidly developing in response to the Industrial Revolution. The new style however, was also tempered with an air of neatness (Rogers, 2001). Downing (1850) integrated the striking irregular patterns associated with the Picturesque Style with the Beautiful Style, which embraced the beauty characterized by simple, flowing forms. His approach shared some elements of Brown’s approach, including limbed-up trees, and lawns with open views to mansions or manors. Interestingly, due to Downing’s horticultural background, his designs included a greater variety of trees and shrubs, including many nonindigenous species, to mask neighboring developed areas in a way that was more successful than Brown’s design approach. The variety implemented within Downing’s designs helped to maintain a rural character within the landscape (Rogers, 2001). Practices employed by landscape designers of the mid-19th Century often involved the use of ornamental plant species and were often manipulated to appear natural, when in fact they were quite contrived.

Jens Jensen (1860-1951), an American landscape architect in the early 1900s, strove to develop close ties between the native landscape and his designs. He was instrumental in the development of the Prairie Style, which emphasized the preservation of local colors, lines, forms, especially space, and the overall character of place. Jensen’s ideals of preserving natural landscapes and associated native vegetation were ahead of his time. As described by Greese (1992), Jensen devoted his career to “[the] problem of preserving and improving the native landscape.” Jensen imitated natural plant
communities, focusing on creating landscapes that provided visual interest, framing with groves of trees, and planting in a way that made one’s passage “an experience of alternating light and shade” (Rogers, 2001, p. 429). The integration of people into the natural landscape and heightened appreciation of the natural landscape through design were two of Jensen’s main contributions to landscape design (Rogers, 2001). Along with consideration of how a design functioned ecologically, as proposed by Jensen nearly a hundred years ago, his approach involved the integration of people into the designed environment and changing their perception of native landscape rather than subjugating design to established cultural perceptions of the time.

In the 1960’s, many landscape designers have begun to consider a site’s original, undisturbed natural conditions and adapt their designs appropriately by working with hydrology and soils, preserving native vegetation communities, using plant materials adapted to the region, and accounting for wildlife needs during the planning process. These overlays created land suitability maps, which prioritized areas important for preservation and areas in which development would be appropriate. The idea of designing landscapes that are sustainable or self-perpetuating and ecologically valuable, while still accounting for human needs, began to be undertaken by many designers’ in the early 20th Century. Landscape architect, planner, and writer Ian McHarg (1920-2001) became known for his contributions to regional planning that focused on natural systems as a major factor in determining urban form. McHarg developed large-scale conservation strategies focused on nature preserves in metropolitan areas, emphasizing the beauty specific to the region, and greater sustainability through cluster development and the preservation of ecologically valuable areas (Rogers, 2001). In 1969, McHarg’s book, Design with Nature, developed a
coordinate map system that used overlays of maps illustrating components of the natural systems. The different overlays might include vegetation communities, climate, geology, soils, hydrology, development patterns, economic demography, scenic values, and other considerations specific to an area or region. These overlays were used to identify and prioritize areas suitable for development and those important for preservation on a large scale. McHarg’s approach to landscape planning enabled designers to look at larger-picture planning and design issues that addressed development on a holistic, broad-based scale, along with its relationship to the natural environment.

Garrett Eckbo (1910-2000), a professional designer, social activist, planner, writer, and teacher, practicing in California, worked with issues related to middle-income residential areas and addressed the interface of indoor and outdoor living as well as the juxtaposition of humans and nature (Eckbo, 1950, 1956, 1998). Treib and Imbert (1997) stated that Eckbo’s design approach stressed the integration of biology and science into planning and design, while abandoning antiquated design approaches and historical convention. Eckbo suggests that people can live harmoniously by combining ecology and society through design.

Contemporary landscape architects Wolfgang Oehme (1930-2011) and James van Sweden (1935- ) stated in their book, Bold Romantic Gardens (1998) that they embrace the use of native, diverse species in their designs by using masses of perennials and grasses appropriately adapted for various regions in stunning artistic compositions. Their plant selections present year-round seasonal interest. The approach reduces maintenance efforts and costs when compared to more commonly used, poorly adapted species (Oehme and van Sweden, 1998). The extensive plant palate used in their designs
contrasts with traditional landscapes comprised of turf grass and annuals that are most common in constructed landscapes planted with non-native plant species. One example of their work includes the design of the Chicago Botanic Gardens in Glencoe, Illinois, which incorporates plants that capture the unique attributes of the midwestern landscape. Oehme and van Sweden’s (2008) design intent for their projects is based on restoration planning to create healthier lakes, plant communities and surrounding ecosystems.

George Hargreaves (2007), a well-known American landscape architect, asks, “How do we achieve sustainability today in an environment where the public may demand something else?” in Large Parks: A Designers Perspective (p.121). This question was best answered through his various project designs, such as for Guadalupe River Park in San Jose, California, where the design intent focused on integrating wildlife habitat into a major recreation park that included topography for flood control, and Crissy Field in San Francisco, California (Hargreaves Associates, 2008). In his book, Hargreaves points to the opportunities that large parks provide for people to experience nature. His work demonstrates that parks do not need to be characterized by the indiscriminate use of lawn and turf to encourage people to use the entire park. However, this can be a difficult prescription to follow where the traditional landscape ideals of creating neatness with the use of turf, annual flowering plants, deciduous trees and the general need to control nature are so ingrained within popular culture.

Andropogon Associates is another landscape design firm that focuses on ecological planning through design. The Avalon Park in Long Island, New York and Gettysburg National Battlefield Park in Pennsylvania are examples of the Andropogon group’s designs. The design for both of these projects focused on the restoration of
native plant communities, blending art and design (Andropogon, 2008). The firm’s work has focused on restoring native plant communities and has created a forest restoration guide titled *Our Once and Future Forests: A Guide to Forest Restoration Strategies* (Sauer, 1998). The forest restoration guide focused on the integration of the successional process of native ecological systems, which includes site hydrology, soil characteristics (e.g. organic matter, soil structure and texture, and chemical properties such as pH and soil fertility), existing introduced and invasive plant species, wildlife and the inclusion of people as part of both the restoration process and the ecological system.

As can be seen from the evolution of design philosophies through the last three centuries, restoration that includes the creative use of planting materials native to an area has developed momentum within the professions of landscape architecture and planning. Swaffield (2002) stated that one significant shift in the theoretical direction of the landscape architecture discipline over the past fifty years has been the development of concepts of “ecological” and “sustainable” design. The practice of landscape architecture is transitioning into one that applies more ecologically minded design solutions that have context and meaning for both society and nature. This transition is not without growing pains; designers waver in their commitment to environmentally conscious decisions within their designs, as does public support. Eckbo et al. (1998) stated that environmentally sound design should continue to expand upon past triumphs of development while recognizing and reconsidering the errors of our past as we invent the future. This approach provides opportunities to address urgent sustainability issues at the risk of negating the value of mainstream design concepts.
Ian McHarg (1969) stated, “Man is that uniquely conscious creature who can perceive and express. He must become the steward of the biosphere. To do this he must design with nature” (p. 5). Design, as defined by landscape architect J. T. Lyle (1985), “is giving form to physical phenomena,” with which humans as a species can feel more comfortable and process more easily. This human act organization can influence, and in many cases hinder, the success of the efforts to restore ecological function of soil systems, plant communities, and other ecologically important processes. By studying historic landscape designers, we can see the shortcomings of their approaches as well as the evolution of a more ecologically founded design approach.

Early designers like Lancelot “Capability” Brown focused on tidy lines and Price and Knight focused their Picturesque designs on carefully structured rugged variation, while Andrew Jackson Downing’s tempered design methods bridged the gap between human dominance over nature and the natural world. Jens Jenson furthered the cause for ecologically aware designs by incorporating what he thought were essential components of native flora and fauna. Eckbo called for consideration of ecological process at different scales. His approach integrated people and nature at a smaller, at a more human scale, while Ian McHarg shifted the focus to large-scale conservation strategies.

Landscape design philosophy continues to develop and evolve as landscape architects emphasize the relationship between context driven purpose (specific to cultural preferences and needs) and function that can create value (specific to an ecosystem) rather than consistency of form, or a philosophy that would be solely based on aesthetic considerations.
CHAPTER III
RESTORATION ECOLOGY

Introduction

This thesis is not a comprehensive study of the ecology of the Intermountain West; rather, the thesis focuses on the above ground characteristics of flora related to the restoration, or re-creation, of a sagebrush grassland plant community. This narrow view of ecology is taken within this thesis because the above-ground manifestation of a landscape is the tangible connection between the visual aesthetic of a landscape and its potential ecological contributions to sustainability in the Intermountain West.

Land managers, lay-people, and stewards of the land have been practicing landscape restoration for hundreds, if not thousands of years (Anderson, 2005); yet the scientific field of ecological restoration was first identified and the term coined in the late 1980's by Jordan et al. (1987); the study of restoration ecology has only become an independent scientific discipline over the last two decades (Young, Peterson & Clary, 2005). The Society for Ecological Restoration (SER) defines ecological restoration as “the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed. Ecological restoration is an intentional activity that initiates or accelerates the recovery of an ecosystem with respect to its health, integrity, and sustainability” (SER, 2004). In the book Restoration Ecology: A Synthetic Approach to Ecological Research, ecologists William Jordan, Michael Gilpin, and John Aber (1987) cite a contingent of the Civilian Conservation Corp workers who, under the direction of Aldo
Leopold (wildlife biologist and environmental writer), began replanting a degraded piece of farmland on the edge of Madison, Wisconsin in 1935. The result was the creation of 24 hectares of prairie that is now owned by the University of Wisconsin. This seminal moment marked the beginning of the conservation movement of which Leopold is cited as both prophet and pioneer.

Subsequent to the introduction of the concept of ecological restoration, scientists began to study the natural world as related to the effect humans have on these systems. Scientific studies continue to underline the importance of preservation and restoration of the natural environment. Hill, White, Maupin, Ryder, Karr, Freemark, Taylor, and Schauman (2002) stated that in order to understand ecology, one must be aware that human actions have consequences in an intricate web of relationships, connections, patterns, and processes in the physical, biological, and social environment. Understanding ecological processes and elements of functioning ecosystems is essential for landscape design and development. The goal of restoration is either to create a self-supporting ecosystem that is resilient to perturbation without further assistance (SER, 2004; Urbanska, Webb, & Edwards, 1997), or to change plant communities with undesirable characteristics to desirable ones (Monsen, 2004), which is the focus of this thesis. Because ecology is a broad science, the following ecological terms and theories will be defined as they are used within this thesis to discuss the consideration of ecological concepts:

- Ecology: the integrative study of organisms, the physical environment, and human society (Odum, 1997);
• Ecological System/Ecosystem: A community and the nonliving environment function together to form an ecosystem (Odum, 1997).

• Ecological Theory: concepts, predictive models and mathematical models to explain pattern and process in ecological systems (Falk et al., 2006);

• Restoration Ecology: the scientific process of developing theory to guide restoration and using restoration to advance ecology (Anderson, 2005; Falk et al., 2006);

• Ecosystem restoration: the process of restoring degraded ecological systems (Falk et al., 2006; SER, 2004);

• Ecological or ecosystem function: the ability of the Earth’s processes to sustain life over a long period of time (Alberti, 2005).

**Elements of Ecosystem Function**

The Society of Ecological Restoration (SER, 2004) identified nine attributes to measure restoration success. These are: (1) the restored ecosystem contains species and characteristics of the reference ecosystem, (2) the restored ecosystem contains native species to the greatest possible extent, (3) the restored ecosystem contains all functional groups for continued development and/or stability, (4) the physical environment of the restored ecosystem is capable of sustaining reproducing populations, (5) the restored ecosystem functions normally for its ecological stage of development, (6) the restored ecosystem is suitably integrated into the larger ecological matrix or landscape, (7) potential threats to the integrity of the restored ecosystem from surrounding landscape
have been eliminated, (8) the restored ecosystem is sufficiently resilient to endure periodic stress events, (9) the restored ecosystem is self-sustaining to the same degree as its reference ecosystem. The extent to which these attributes can be fulfilled will determine the extent of recovery and self-maintenance of restored ecosystems.

The discipline of ecology defines ecosystem function as the ability of Earth’s processes to sustain life over a long period of time (Alberti, 2005). Ecologists look at the following three primary indicators to assess ecosystem health, overall functionality, and to gauge overall site health: (1) productivity, which is the amount of biomass produced through photosynthesis per unit area and time by plants; (2) biodiversity, which is indicated by the numbers of different species of plants and animals (Merriam-Webster, 2010); and (3) structure, exemplified by physical variation within classes of herbaceous vegetation such as graminoides, sedges, rushes, forbs, grass species and woody vegetation (Alberti, 2005).

Different species provide specific functions within an ecosystem, and changes in species composition, species richness, and functional type affect the efficiency with which resources are processed (Alberti, 2005). The resilience of a system depends on the distribution, abundance, and dynamic interactions of species (Peterson and Holling, 1998; Holling 2001). Often the disappearance of key species, known as indicator species, precedes reduction of ecosystem function and overall health (Rapport, Regier & Hutchinson, 1985). However, the definition of restoration success varies widely from one professional to another as it reflects his or her own view of nature. Restoration success is largely dependent on context, expectations, and goals for a specific landscape. Because
ideas on what represents nature are variable, historic conditions (e.g., the natural history of a site) can provide the ideal starting point for restoration design (SER, 2004).

One element that has been identified as problematic in restoration is the introduction of nonnative flora and fauna within an ecosystem. Nonnative species, especially nonnative invasive species, are a major conservation and management concern in natural ecosystems because of their high level of adaptability and ability to reduce or displace native species (Callaway and Ridenour, 2004; Hobbs and Huenneke, 1992). Proper identification and removal of these species are essential to establishing and maintaining functional plant communities during the restoration process. Because nonnative species often displace diverse native plant communities, change energy and nutrient cycles, degrade landscape productivity (i.e. aesthetic value, recreation, wildlife use as habitat, and forage production), the presence or absence of nonnative species can be considered as a key indicator of ecosystem health. The degree and type of disturbance frequently dictates the severity of nonnative invasive species. For example, natural areas once utilized for agriculture often completely lack remnant native plant species as a result of clearing and intensive alternative use. These areas reach a state of successional paralysis in which native vegetation has been displaced and species introduced either by intension or accidental introduction, continue to proliferate.

Diaz and Cabido (2005) acknowledge that biodiversity probably plays a significant role in directly providing goods that underpin the delivery of ecosystem services. Ecosystem services are the processes by which the environment sustains or produces resources that we often take for granted such as clean water, timber, habitat for fisheries, and pollination of native and agricultural plants (ESA, 2000). In considering
ecosystem function within this framework, functional diversity should be the focus of biodiversity conservation (Folke, Hookings, & Perrings, 1996). Biodiversity is also an indicator of ecosystem health, as its loss can herald significant underlying disruptions. As Carson (1962) in *Silent Spring* and Steingraber (1997) in *Living Downstream* discussed, human health is connected to the health of the environment. Ironically, human activities may disrupt the very life systems on which we all depend (Bormann, Balmori, & Geballeh, 2001).

Another way in which humans adversely impact ecosystems is through land development patterns associated with urbanization or suburbanization. When areas are utilized for urban and suburban developments, much of the native vegetation and topsoil is replaced by impervious surfaces such as roofs, roads, parking lots and pavement. When the natural landscape is altered, rainfall that was once absorbed into the ground must now be collected by storm sewers, which send water into local streams and often contain contaminants such as oil and garbage (USGS, 2011). Areas left as open space, such as residential yards, remnant natural areas and parks, are often planted with turf grasses, which, through common use, require the use of fertilizers and pesticides. This can contribute to regional water and air pollution problems. Institutions and green industries often endorse the use of high-input landscape features (e.g., lawn, annual flower beds) that dominate private residential gardens and influence the standardization of landscapes that in turn create costly, high-input environmental and economic maintenance standards. With industry promotion of standardized, high-input landscaping materials, it is common that conditions specific to a given site are not taken into consideration during the selection of planting materials.
On the other hand, landscape ecologists promote the idea of using plant species that are native to a region in restoration and urban design. Diedelmann and Schuster (2002) advocate the use of native plant communities within designs to promote regional landscape context. Plants can be grouped by physiological needs such as moisture, soil, slope, aspect, proximity to water, depth to water table, wildlife and light requirements, to name a few. Species that share an evolutionary history within a place have the potential to create systems that require less human intervention (i.e., maintenance) to sustain landscapes that meet high ecological and aesthetic standards. It is generally believed that standardized landscapes, such as lawns and tidy annual borders are easier to maintain, require less time, and are “safer” in that they are tidier and minimize opportunities to harbor snakes, spiders, or encourage visitation from bee and wasp species. However, the possibility of adversely affecting the environment is a compelling counterpoint to the possibility of encountering insects, herps (snakes), or other perceived pests commonly found in gardens.

Consideration of a site’s ecological function and value based on biodiversity, productivity and structure as described earlier has the potential to contribute to a holistic approach in landscape architecture (Makhzoumi, 2000) by facilitating the application of scientifically guided restoration and application within the urban landscape pattern. For aesthetics and ecology to become aligned, some environmental designers, philosophers, and social scientists have advocated expanding the scope of landscape aesthetics to incorporate ideas of ecological processes. This is known as “ecological aesthetic” (Gobster et al., 2007).
The ecosystems of both smaller residential landscapes as well as larger parks and natural areas that are found in urban and suburban regions can contribute rather than detract from the natural, regional environment and add to the restoration or recreation of a native, functioning system that is based on a regionally specific reference ecosystem. These landscapes (i.e., the composite of public and residential landscapes) are “our own little piece of the biosphere” (Bormann et al., 2001) that we can use to enable more functional ecological systems to develop through plant selection and design to create native plant communities.
CHAPTER IV
HUMAN LANDSCAPES: CULTURAL PREFERENCE AND ECOLOGICAL AESTHETIC

Introduction

The idea of nature—what was or is occurring naturally in landscape systems—is important to explore while trying to understand cultural perception and preferences. As Spirn (2002) stated in *The Authority of Nature: Conflict and Confusion in Landscape Architecture*, the term nature is an abstraction with no singular definition. Despite the lack of a general consensus and a wide range of ideas on the definition of “nature,” there is a growing concern regarding the future of the environment and increased interest in the need to reconstruct our conceptions of nature. Within this thesis, the term nature refers to a landscape’s native, or pre-European settlement, in particular, native plant communities. In the last few decades, human activity has significantly impacted the natural landscape. The rapid urbanization of landscapes, particularly by development on private lands in rural and natural areas, is threatening North America (Dale, Brown, Haeuber, Hobbs, Hantly, Naimen, Riebsame, Turner, & Valone, 2000; Hansen, Rasker, Maxwell, Rotella, Johnson, Wright, Lagner, Cohen, Lawrence, & Kraska, 2002; Theobald and Hobbs 1998; Travis, Theobald & Edwards, 2002). Urban and suburban development disrupts native habitats and the biodiversity of flora and fauna by destroying native plant communities. Urbanization includes the expansion of suburbs, increased road density, upgrading of roads (Theobald, Spies, Kline, Maxwell,
Hobbs, & Dale, 2005), parking lots, shopping facilities, airports, schools and other public services. Urban development fragments, isolates, and degrades natural habitats; simplifies and homogenizes species composition; disrupts natural hydrological systems; and modifies energy flows and nutrient cycling (Alberti, Marzluff, Shulenberger, Bradley, Ryan, & Zumbrunnen, 2003). Urban and suburban development replaces once ecologically productive, self-sustaining systems with landscapes that require more natural resources and produce large quantities of waste. These adversities can be partially mitigated through restoration and ecologically inspired design.

In general, the people who reside in urban and suburban environments do not value landscapes that are valuable ecologically; wetlands are a classic example. Urban and suburban landscapes are typically designed for uniformity, economy, and convenience and the use of turf, annuals and chemical fertilizers and pesticides are promoted by the corporate green industry. As a result of this uniformity and use of pesticides, the landscapes created foster minimal biodiversity. Although prominent landscape architects and designers have sought to design landscapes with consideration for ecological processes, the ecological basis for the design elements used is not always convincing or well founded.

**Human Origin, Nature, and Human Preference**

For humans, the aesthetic pleasure derived from interactions with the landscape is both a reflection of evolutionary history and a key driver of contemporary environmental behavior, including land use, development policies, and real estate
markets (Gobster et al., 2007). Falk (1992) suggests that our modern preference for lawns and trees is an innate expression of our origins. Since humans evolved in the grassy, tree-sprinkled savannas of Africa, humans find lawns a safe and potentially supporting environment. Open spaces with limited biodiversity provide “legibility” (Hiss, 1990), making a landscape easier to comprehend on a human scale. Legibility is created by boundaries and familiar elements within a landscape such as clean lines, fences, planters, and pathways that represent structure and an invitation for human participation.

A narrow selection of planting materials and simplified ideas of the “natural” landscape has resulted from human attempts to process, understand and control the environment. It is probable that we as humans have removed ourselves so far from native ecosystems that we are no longer comfortable or familiar with the elements of a healthy, functioning, native ecosystem. The inability to recognize a functioning ecosystem creates issues for design as well as for the utilization of elements, features, habitat and landscape types typically preferred by the general population. The current landscape preference is characterized by simplified lines in the design of spaces, a limited variety of introduced plants and high input and maintenance levels.

If degraded landscapes are accepted as “reference sites” on which restoration designs are patterned, there is an increased likelihood that these restored landscapes will fail due to missing key components, such as healthy soil composition, irregular microtopography, and plant and animal species that were likely present prior to the sites disturbance. To compound the problem, a lack of community support or understanding of the larger ecological context may reduce the likelihood these landscapes will be
maintained or preserved as native ecosystems. In summary, our understanding of what nature is influences our enthusiasm for complete or thorough restoration, and ultimately undermines the success of restoring degraded systems.

**Perceptions of Nature and Cultural Ideals**

Human perception of nature is a mirror of the prevailing culture. Ideas of nature reveal as much or more about human society as they do about nonhuman processes and features (Spirn, 2002). Because most people are unaware of what an ecosystem looked like prior to human settlement, the linkage between the functional ecology of a site and its full aesthetic potential is often lost. What we see as native or natural may in fact be an already severely degraded ecosystem that is missing key functional ecological components. Ecosystem function becomes an issue when we attempt to recreate a native plant community and the reference landscape we use is, in actuality, setting restoration efforts up for failure because of missing keystone elements that are required to establish and sustain an ecologically viable landscape. If a landscape become problematic (e.g., invasive species become established and native plant species lack vigor) the attempted restoration effort will fall short of aesthetic expectations because a site may look weedy and unkempt. For instance, standard bluegrass lawns are seen as landscape features that well kept, require less time to maintain, and present a “safer” alternative for people with a phobia of spiders, snakes, bees, wasps and other insects.

Nassauer (2002) states that landscape design is a cultural action about nature, and landscape design constructs ecosystems; specifically, the way we view the natural
world drives how we reshape the landscape. Because design significantly affects ecological processes, design has a necessary relationship with ecology. Landscape design presents great potential to improve or degrade ecosystem function. Initial efforts to restore native ecosystems must be well informed to be successful or they will be abandoned.

![Figure 3. Residential Landscape Comparisons](image)

The aesthetic and cultural preferences expressed in contemporary landscape design often represent lost opportunities for preservation, habitat creation, and restored ecological function within landscapes. Unfortunately, these commonly held cultural preferences result in the use of species that are not well-adapted to a region and that provide...
inadequate biodiversity. Such ecologically destructive practices, which threaten the environment when viewed on a global scale, are especially evident in smaller landscapes, such as the home landscape that is dominated by lawn (Bormann et al., 2001).

Because private domestic gardens are known to constitute a considerable portion of green space found within urban and suburban areas (Loram, Tratalos, Warren, & Gaston, 2007), they hold potential significance for individual action to produce positive global effects (Bormann et al., 2001) by the reduction of non-point source pollution, increased wildlife habitat, reduction of energy and resource inputs (fertilizers, pesticides, and water), and improved water quality through reduction of run-off contaminants (Figure 3).

**Human Impacted Ecosystems**

Zipperer, Pouyat, and Pickett (2000) stated that basic concepts of an ecosystem must incorporate a human component. Humans are an intrinsic part of how an ecosystem functions and have a great influence, sometimes positive and often negative, within any ecosystem in which they live. A dominant element humans contribute to the ecosystems in which they live and work is extensive plantings of lawn on the landscaped (disturbed and developed) areas surrounding their private homes and public spaces, industrial parks, shopping malls, and schools. Bormann et al. (2001) and others have suggested reducing the amount of lawn planted in commercial and residential landscapes. Roughly 80 percent of U.S. households use pesticides of some kind, 50 percent of which are weed killers (Steingraber, 2002) used around their homes. Not only can the use of pesticides create non-point source pollution with negative implications for water quality, but some
pesticides can have a direct negative impact on human health. Yard and garden pesticides have been associated with cancers in young children as well as an increased occurrence of cancer in golf course superintendents, possibly due to the fact that golf courses use four times more pesticides per acre than an agricultural field (Steingraber, 2002). The inherent health risks and negative ecological impacts associated with the maintenance of typical urban and suburban landscapes beg for the adaptation of preferences and design practices that reset cultural preferences toward well-adapted, sustainable environments that will be healthier for humans and other animals such as pets without high levels of chemical and physical inputs.

In arid regions of the United States, such as the Intermountain West, irrigation is essential for the maintenance of turf. Higher evapotranspiration rates require higher quantities of irrigation water to maintain a turf-intensive lawn (Bormann et al., 2001). A 2005 Brookings Institute report demonstrated that 10 of the 15 fastest growing metropolitan areas are in the relatively arid climate of the western United States (Frey, 2005). Western states also have some of the highest per-capita residential water use rates in the nation. Far exceeding the national average of 179 gallons a day, Utah households use 292 gallons per day on average (EPA, 2006). It is estimated that the amount of water typically used to maintain home landscapes ranges from 50 to 70 percent of the water used for urban purposes (UDWR, 2001), with the largest proportion used to water turf. Excessive water demand depletes streams and aquifers, and drives the construction of new reservoirs on existing rivers and smaller watercourses. The impacts on wildlife, fish and other aquatic species as well as on established cropping and grazing enterprises of this growing urban water use can be devastating during times of drought.
In addition to competing with wildlife and agriculture for water consumption, poorly managed irrigation of lawns increases the amount of water runoff from a landscape and proportionally reduces the deep seepage (Bormann et al., 2001) that is required to recharge groundwater supplies, filter contaminants and prevent the addition of sediment and other contaminants to open water courses, negatively affecting water quality. Adopting a new aesthetic which values ecological sustainability over high maintenance, non-native species could reduce a high proportion of home landscape water use by eliminating or reducing turf.

Bormann et al. (2001) proposed that the notion of the beautiful lawn landscape established in the 18th Century must be reshaped to a new aesthetic consistent with a new ecological ethic that extends traditional boundaries beyond only considering human life, to considering non-human life as we design and develop a landscape. Although decisions about landscape change are made on a scale that humans are able to register or notice, these decisions affect environmental elements beyond our ability to detect and understand. Gobster (2007) states, “It is difficult for people to understand, care about, and act purposefully upon phenomena that occur at scales beyond our own direct experience” (p. 960). Public spaces like those found at the UBC could be used to bridge this gap by providing experiences with native landscapes that can be understood on a human scale.
Human-Assigned Value of Ecological Function

Understanding the aesthetic experience specific to the landscape is important, particularly because landscapes that are perceived as aesthetically pleasing are more likely to be appreciated and protected than are landscapes perceived as undistinguished or ugly, regardless of their ecological importance (Gobster et al., 2007). Early settlers in the 19th Century did not look on wilderness with the eyes of a Sierra Club backpacker. Their main intent was to tame the wilderness to make it a more safe and productive place for human habitation. Lands were cleared to provide for agriculture and housing, and eventually vast networks of infrastructure would provide accessibility for humans to nearly every region of the North American continent. The wilderness of today is made up of small islands in a tamed continent that was once a “vast, wild, and totally unknown land occupied by wild beasts and wild men” (Stegner, 1990, p.35). It is no surprise that wild or natural landscapes are not routinely embraced and protected, especially given a pervasive religious belief in man’s dominance over nature. As Stegner (1990, p. 35) states, “We are still in a transition from the notion of Man is as master of the Earth to the notion of Man as part of it.” In 1989, a study by Kaplan and Kaplan demonstrated that the public’s aesthetic reaction to many ecologically valuable landscapes is negative. Although the idea of ecologically and regionally appropriate design appeals to the environmentalists of the 21st Century, the actual acceptance, value, and implementation needed is lacking among communities.

The perception of wild or untamed areas has shaped America’s views and actions upon the landscape. Landscapes that embody positive ecological qualities (e.g., diverse
native plant species, complex structures, different habitat types) tend to look messy, and this poses problems for those who imagine and construct new landscapes to enhance ecological quality (Nassauer, 1995a). Although the mainstream landscape industry claims to be a proponent of ecological or “green design,” in practice, it continues to be a peripheral ideal that is scarcely implemented. Gobster et al. (2007) posed the question, “What does aesthetics have to do with ecology?” They state that landscape aesthetics provide a critical linkage between humans and ecological processes. People’s perception of ecology is influenced by aesthetics; if a landscape is considered visually pleasing, then it must be ecologically valuable. The perceived aesthetic value of landscapes can influence the attention given to ecological quality (Gobster et al., 2007). Ecological restoration requires accepting the necessity of linking the plant ecology of restoration with larger cultural meaning (Jordan, 1994).

One approach that can be used to link cultural preference and value to contemporary ecological design is the inclusion of native plants and plant communities that are presented in a form that is comfortable and legibly perceived by users. It is difficult to introduce biologically diverse and adapted plant communities within a residential landscape or community parks system. The acceptance of formally designed landscapes with introduced, high-maintenance elements (e.g. turf, introduced shade trees, and annual flowerbeds) results from experiencing mass marketing perpetuated by the landscape industry to shape what a ‘desirable’ home landscape should look like, and the subsequent adoption of these ideals by the larger community. Unfortunately, regional appropriateness and ecological function are not the first priority for most corporations involved in the landscape business, and optimal ecological function may be at odds with
the conventions of current aesthetic values, good taste, and civic spirit (Hough, 2002). Neighbors who have what is perceived as “natural” landscapes are in some cases looked upon as delinquent homeowners. However, in areas where landscape water use has been restricted by local governments or after long periods of drought, such as Las Vegas, Tucson, and Phoenix, many homeowners have given up their turf grass for native shrubs and flowers (Nijhuis, 2006). There is a growing acceptance of the use of native plant species and native plant communities.

Nassauer (1995a) points to studies indicating that the dominant views are that a neat, orderly landscape is a sign of neighborliness, hard work, and pride. Unfortunately, the social pressures associated with landscaping choices contradict ecologically founded design. The notion that an emerging plant community and visual chaos (e.g. messy elements) needs improvement or tidying up is too easily imposed upon urban and residential landscapes (Hough, 2002). These cultural preferences are not conducive to the natural successional process within a landscape, or the ability of a plant community to change over time, evolving from domination in early stages by invasive annuals to diverse and competitive stands of perennial bunchgrass, shrub and/or trees and forb species. In viewing natural processes and the results of those processes as aesthetically undesirable, designers and communities may be preventing the establishment of robust and sustainable low-input naturalized landscapes.
Designing for an Ecological Aesthetic

Gobster et al. (2007) define ecological aesthetic as a design template that could significantly increase the amount of biodiversity and wildlife habitat, decrease the need for pesticides, water, and fuel, and improve the quality of life for human and non-human species. From literature that has been presented so far, it can be concluded that the benefits of protecting scarce but essential resources such as water in a semi-arid climate are indisputable. The aggregated effect of individual residences, city and county managers adopting an ecological aesthetic hold significant opportunities to improve public health and quality of life.

Enjoyment and appreciation of native or natural landscapes can be achieved in part by framing ecological function with culturally recognizable elements integrated into the design. However, the current perception of what is beautiful is more closely linked to the 18th Century concept of the Picturesque and the Beautiful than it is to the understanding of ecological function (Bonsignore, 1992; Robinson, 1991). The Picturesque style emphasizes the value of open pastoral settings of grazed or mowed lawns and simplified plantings that are not “clouded with dull and gloomy thickets and excessive ground covers” (Rogers, 2001, p. 196). The Picturesque Style has such strong appeal that it has become part of popular culture to the extent that such landscapes are often equated with ecological health (Nassauer, 1997).
Landscape Cues

Ecologically functional systems can be accepted by the public if certain landscape cues that are recognizable and indicative of human presence are included within a design (Nassauer, 1988, 1995, 1997; Williams and Cary, 2001; Gobster et al., 2007); these cues invite human engagement (Gobster et al., 2007). For example, a trail or road through a wooded area or grassland encourages humans to experience the landscape by defining how humans can participate. This human involvement may or may not be beneficial for the ecological process of a landscape. However, engagement fosters a sense of ownership that may result in the protection of a landscape and the ecological services it can provide, such as clean drinking water, groundwater recharge, wildlife habitat, decomposition of waste, food production, and recreation (Millennium Ecosystem Assessment, 2005).

Social pressures make the introduction of greater biodiversity to the urban landscape problematic if it results in the appearance of a lack of care (Nassauer, 1995a). Landscapes that include native or naturalized plantings can result in a composition that appears chaotic and unkempt. Such planting designs are usually not appreciated by neighbors and are frowned upon by the community. A haphazard placement of plants that looks weedy fosters the assumption that the owner is negligent and not interested in the aesthetic values of the community. Nassauer (1995a) suggests that such landscapes are not speaking the cultural or vernacular language needed for people to understand them and feel comfortable.
Landscape architects need to strike a relationship with vernacular design traditions by using familiar, conventional symbols applied to a different purpose (Nassauer, 1995a).

This thought has been presented elegantly in the following paragraph:

…Cues to human care, expressions of neatness and tended nature, are inclusive symbols by which ecologically rich landscapes can be presented to people and can enter vernacular culture. Working from vernacular culture is necessary to infiltrating everyday acts of landscape change and ultimately achieving radically innovative pervasive landscape structure… (Nassauer, 1995a, p. 163)

Because the cultural preference for a certain aesthetic is so closely tied to perceived human intent, or care, Nassauer (1997) suggests that perceived care or intent translates into a perceived aesthetic value for a landscape. Functional ecosystems that incorporate intent and in which it is easy to perceive that necessary level of care can connect cultural preferences and patterns with ecological processes by speaking the vernacular language that drives cultural acceptance within landscape design.

Nassauer (1995a) identified seven elements that indicate human intention and care, which are recognized as cultural symbols that a landscape is occupied. These elements can be used to frame more novel and valuable ecosystems within inhabited landscapes by making these novel landscapes more familiar: (1) mowing, (2) flowering plants and trees, (3) wildlife feeders and houses, (4) bold patterns, (5) trimmed shrubs and linear planting designs, (6) fences, architectural details, lawn ornaments and paintings, and (7) foundation planting. These cues are familiar elements within traditional landscapes that offer a comfortable association between human intent and tradition, and landscapes that are ecologically valuable and contribute to the larger environment.
Williams and Cary (2001) promote the use of landscape design to soften community concern for grassy or other less appreciated ecosystems. Their approach seeks to enhance community understanding of natural environments by creating conceptual links between these environments and more familiar elements of parks and gardens. With the use of appropriate planting material, landscapes that are ecologically valuable can be framed by conventional materials, which could result in wider cultural acceptance. Appropriate selection of native and or ecologically valuable species is essential to the creation of ecosystems that are able to function but still measure up to the aesthetic demands that humans impose. For example, if a grass species is mowed on a regular maintenance schedule, the species selected for this application should be tolerant of mowing, fill an environmental or ecological purpose (such as providing needed biodiversity or reducing the need for pesticide use) and meet expectations of a community’s aesthetics. Nassauer (1995a) noted that the use of species that produce large, bright, abundant blooms is associated with care, and in turn aesthetic value is assigned to the landscape that includes these elements. Bloom period, color, and intensity are important considerations when creating or restoring ecosystems that depend upon cultural acceptance for continued success. Certain species are best adapted to specific landscape applications; therefore, knowledge of a diverse plant species palate and the composition of vegetation communities allow designers to incorporate the widest possible range of plant species into their designs.

Using a familiar vernacular to house an unfamiliar ecosystem involves strategically positioning elements of the old landscape such as turf and annual and perennial flowers as signposts from the familiar ecosystem (Nassauer, 1995a). Landscape
designs can be modified to incorporate the natural disorder of native ecosystems if the reassuring visual framework of human presence is retained (Nassauer, 1997). Through the conservative use of familiar landscape elements such as areas of mowed turf and plants with large blooms, alternative landscape designs incorporating diverse plant palettes and sustainable groupings of plant species will find greater acceptance.
CHAPTER V
EXAMINING AND INTEGRATING ECOLOGICAL PRINCIPLES
AND DESIGN ELEMENTS UNIQUE TO THE INTERMOUNTAIN WEST THROUGH THREE DESIGN EXPRESSIONS

Introduction

Design elements as defined by Booth (1990) (e.g., scale, form, space, movement, form, texture, variety, repetition, line, color) and design principles (e.g. dominance, contrast, unity, variety, balance, rhythm, repetition) are valuable for composing designs and for defining our relationships with a landscape. Elements of design are attributes of the physical environment, and design principles suggest how to structure elements within the design process and contribute to the qualitative experience of a landscape. Designers assess visual characteristics of landscapes and manipulate elements of design to achieve a desired outcome. The principles of design are the precepts that designers in all the arts use to structure elements to create designs that communicate an idea and a certain aesthetic. These elements and principles of design guide the designers who create spaces. Williams and Cary (2001) suggested such a use of conceptual links (e.g., design elements) between natural environments and constructed landscapes. The framework provided by the appropriate use of design elements and principles can offer guidance for human use by organizing spaces, directing movement, and providing rhythm and comfort through the use of form, texture and repetition of planting materials. Designers, restorationists, and landscape architects can use a fundamental design vocabulary to
articulate their ideas and develop the ideal of an “ecological aesthetic” as presented by Gobster et al. (2007) into cohesive plans for specific applications as it relates to ecological function.

Each landscape, natural or altered, holds countless design possibilities. Natural landscapes have an extensive natural history in which plant communities, insects, and wildlife have evolved through time into a specialized, productive, and stable ecosystem exclusively composed of native species. Many landscapes have been modified after this evolution by human activities such as logging, grazing, agriculture, urbanization and other forms of development.

The intent of this chapter is to draw parallels between the landscape aesthetic found in the natural world, ecological function and the potential application of these principles to shape regionally specific, meaningful landscape designs. The three design proposals described in this chapter draw at varying degrees from either surrounding cultural cues, desirable characteristics from the natural landscapes and ecological purpose and function. These approaches are combined to embody the physical and biological attributes supporting ecosystem health, and are incorporated into proposed templates for landscape designs and restoration plans from the smaller residential scale to larger parcels of lands, like that of the UBC. The presented designs are conceptual and intended to provide a platform for comparison rather than serve as a “master plan” specific to the entire existing infrastructure surrounding the study site.

The three different designs presented in this chapter applied ecological and design elements and principles within a regional aesthetic specifically drawn from sagebrush grasslands of the Intermountain West and are used to explore, compare, and critique
potential design approaches. These comparisons included consideration of reference ecosystems, the use of native plant species and functional groups to the greatest possible extent, sustainability of the site, functional stage of development, linkage to other native ecosystems, and resilience to stress. The first design expression is a traditional approach that represents an interpretation of typical cultural ideals that are commonly observed within modern urban and suburban landscapes in the Intermountain West as derived from the previous discussion in Chapter 1. The second design expression proposes a basic ecosystem restoration philosophy that follows current restoration science as applied in the Intermountain West. Finally, the third design expression integrates restorative science with design elements and principles into an ecological aesthetic design. Each design expression is critiqued using the same criteria in order to assess their human/cultural and ecological/environmental value. Care was taken to assure that each expression references the landscape that was native to this same location before European settlement of the Intermountain West by considering criteria such as context, spatial character, movement/paths, edges/transitions, foci, color, texture, variety, repetition, surrounding urban development patterns/design, and potential ecological contributions.

Lyle (1985) stated that every ecosystem is a part—or subdivision—of a larger system, no matter how small or fragmented a system may appear. Ecological value can be present at any scale. As in natural or cultivated landscapes, valuable ecosystems begin at the level of, for instance, a small home landscape patch, which together with others, forms a mosaic of small backyards that cumulatively can change the fabric of urban and suburban neighborhoods (Johnson and Hill, 2002; Loram et al., 2007). Gardens can be a major component of urban “green space” within this complex and heterogeneous mosaic
of habitats in the midst of suburban development. Figure 4 illustrates the varied scale of urban habitats from the larger natural areas (Illustration “A”), to agricultural lands with hedgerows comprised of native plant species (Illustration “B”), to small residential gardens (Illustration “C”).

![Image](image.jpg)

**Figure 4.** Ecological value can be found at all landscape scales. Larger natural areas, hedgerows of agricultural farmlands, and small residential gardens can create large and small pockets of habitats.

Well-landscaped and managed urban and suburban areas (including domestic gardens) present the opportunity to positively affect the environment by adding significant land area capable of a positive contribution to water quality, wildlife, and beneficial insects, while reducing inputs (e.g., fertilizers, pesticides, water). Martin and Warner (1997) point out that ecologists have largely neglected urban areas, even though they are indeed ecosystems, fragmented and degraded. The ever-expanding presence of humans means an increasingly significant portion of the environment is directly impacted by human use; humans profoundly impact the ecology of any site they occupy. When urban and suburban landscapes are designed to include positive ecological considerations, such as proper plant selections that contribute to a healthy native plant
community, wildlife habitat components, reduced water requirements, and minimal intended use of insecticides, herbicides and fertilizers, they have the potential to contribute to broader ecological health of the environment.

**Line: Delineating Space and Creating Habitats**

Lines that can be perceived within the natural environment are gently sweeping curves that follow water sources, topographic and elevation change, soil types, and disturbance patterns. Lines can result from intimate interactions of biota within a landscape, or be due to varied soils, exposure, microclimates, topographic relief, water, and other biotic or abiotic factors. Abrupt changes within vegetation communities rarely form distinct lines; gentle transitional gradients, or ecotones, are more commonly seen. Lines found within natural landscapes are subtle, understated and sometimes implied.

The spacing and distribution of plants is often a function of water and nutrient resource availability, and is impacted by the activity of animals such as rodents and birds. Creating undulating or curvilinear lines within a constructed, typically smaller landscape is facilitated by manipulating irrigation water. Bold, distinct curves can be created by increasing the density of plants of varying color, texture, and form when the natural limitations of water, seed dispersal, and harsh establishment conditions are mitigated by landscape design.
**Color: Using the Palette of the Region**

As defined by Ching (1996, p. 34), “color is a phenomenon of light and visual perception.” Color is the attribute that most clearly distinguishes a form from its environment. Many plant species have developed special adaptations to attract passing insects for pollination and eventual reproduction. One of these adaptations involves the use of vividly colored blooms and staggered bloom periods among species. This is not only advantageous for plant propagation, but it is also ideal for creating emphasis using visual landscape qualities. Ching also stated that color can introduce variety, repetition, emphasis, and affect the visual weight of a form. Through careful choice and use of plant species, this attribute can be used to provide year-round interest within a landscape. Plants can proliferate and create dynamic plant communities in a small urban flowerbed or a large-scale restoration project.

Extensive regional biological diversity displays a strong sense of identity; specifically, the unique palate of colors creates a sense of place when incorporated into a landscape design. The colors found within the Intermountain West are often subtle and unique, and include deep blue-grey, pink, washes of orange, cream, tan, and soft green hues (Figures 5 and 6). These landscapes have perfectly paired complimentary colors such as the oranges of exposed soils, rocks and plants such as globemallow, with the blue-green hues found in sage, grass, and sky.
Figure 5. Landscape characteristic of the southern Intermountain West: Photo taken in the southern Intermountain West showing exposed redrock in a shrub-steppe plant community dominated by rabbitbrush, snakeweed, bunchgrasses and forbs common to the southern Intermountain region. Photo credit: Bridget M. Atkin.
Figure 6. Basin and range features typical of the Intermountain West. This photo taken in eastern Nevada shows characteristic blue-gray mountains in the background and complimentary yellow, buff, and sage hues in the foreground. Photo credit: Bridget M. Atkin.

**Form: Creating Structure with Informal Species**

By defining the juncture of mass and space, the landscape architect or designer from other disciplines is making a statement about the interrelationship of man and his universe [or environment] (Bacon, 1967). Often, the transition between landscapes that humans occupy and the natural environment is characterized by abrupt boundaries such as fences or walls common to the assertion of property boundaries and elements in the constructed landscape. Dee (2001) states that spaces can be given form through the
abstraction of naturally occurring patterns created by vegetation, rock, water bodies and landscape process at both macro and micro scales. Alternatively, natural processes such as plant succession can ‘shape’ or create spaces with natural features. As discussed earlier (see Gobster et al., 2007; Nassauer 1988, 1995a, 1997; Williams and Cary 2001), humans tend to prefer neatly sheared hedgerows of evenly spaced plants. Yet, competition for soil, light, and moisture has forced the evolution of species into differing forms that confer an advantage for capturing resources by filling specific resource niches. As an example, many plant species native to the Intermountain West are compact and efficient in the use of water and soil nutrients, indicative of the limited resources found within the region.

The structure of most Intermountain native plant species is informal in nature, both in habit and in their sporadic arrangement within the landscape. Jens Jensen (1939) spoke of grouping individual species together…‘some plants to be at their best need association in a small colony or group” (p. 41). Species native to the Intermountain West tend to be more visually effective when used in groupings or masses. This type of arrangement can strengthen or heighten the perception of this landscape’s structure in a specific context. Native plants that lack structure, or are ‘airy’ or have minimal or very fine foliage as a result of adaptations to low precipitation, require a contrasting background to help them showcase their often-delicate forms.
Texture: Functional Characteristics

Ching (1996, p.34) describes texture as “the visual and especially tactile quality given to a surface by the size, shape, arrangement, and proportions of the parts. Texture determines the degree to which the surfaces of a form reflects or absorbs incident light.” Texture is an important characteristic for many native plant species found in arid grasslands or shrublands. Often, plant species native to the Intermountain West have finer textured foliage when compared to species growing in landscapes in which water is more abundant. The limited water commonly found in Intermountain West environments often supports smaller-leaved species that conserve water by reducing transpiration from leaf surfaces. Not surprisingly, finely textured species like grass, sagebrush, greasewood, and four-wing saltbrush commonly occur within the Intermountain West. Because of the fine textural qualities and resulting small leaf size, native plant species emphasize the vastness and openness of this landscape. As expected, contrasting textures are found along streams, springs, and wetlands where vegetation is not as limited by water availability; plants in riparian areas often have the luxury of coarsely textured foliage. Lines created along riparian corridors are emphasized by the contrast in both color and textural gradients of vegetation communities as shown in Figure 7.
Hydrozones, or plantings with similar water requirements, can similarly be developed within a landscape design that allows the designer to emphasize differences in textures between vegetation communities contained in small-scale planting plans. By including species with different water requirements in one landscape, the designer is able to create line through differing textures, form and structure of species, tonal differences of foliage, and variation in habit, form and size.

Variety: Biodiversity

Despite limited water and soil nutrients, desert environments contain an abundance of biodiversity, creating habitat richness and variety. Species richness or biodiversity can indicate health within an ecosystem, resilience to natural or human-induced disturbance, and increase its perceived aesthetic value to the general population. The vastness of the Intermountain West landscape and the binding qualities and
uniformity of dominant plant species create a unique aesthetic appeal while remaining visually cohesive. Binding species are those that are dominant within a particular vegetation community and that are used with repetition to create a sense of unity.

Seasonal variation is often the greatest during spring, producing a display of colors and textures with annual and perennial blooms. This seasonal display can be extended with selected species through irrigation management and plant maintenance practices.

To introduce variety or biodiversity within a landscape design, it is important to consider appropriate scale. A common mistake in small-scale native residential landscape design is the use of too wide an array of species which display excessive variety in form, texture and color, contradicting the other fundamental design principle of unity through repetition of form, texture, color and consideration of scale in relationship to the overall context of plant species. This approach would create a landscape that resembles a collection found in a herbarium with no sense of unity rather than a deliberately designed landscape.

**Repetition: Unifying a Landscape**

Plant species may occur across vast areas of a landscape, crossing vegetation community boundaries, and in many cases are dominant or co-dominant within a particular vegetation community. These dominant species fulfill important ecological and aesthetic functions. Grouping plants of similar form and texture, and repeating them throughout the design can create unity by proximity within the landscape, and are
referred to above as binding species. Repetition suggests intent and provides cohesion, preventing a composition from appearing fragmented and chaotic. Differing species of grasses and shrubs with similar form, scale and texture can serve to create this unity within the landscape. Within these groups that have shared characteristics there can be considerable plant species variety.

**Emphasis: Finding Focus**

Emphasis within the Intermountain West region can be achieved by directing the eye to a focal point in the landscape with the use of lines, form, variety, and color. As shown in Figures 5 and 6 earlier, the unique and exposed geology of the Great Basin serves as both backdrop and point of emphasis. This landscape derives from an ecology of contrasts in which the smallest trickle of water creates a burst of vibrant green hues. These extremes in exposure and resource availability bring emphasis through landscape structure (e.g., landforms such as mountains and sandstone buttes) and vegetation patterns. Elements such as broad swaths of one wildflower species in bloom, groupings or masses of vegetation, landscape features such as rock outcroppings, buttes, hills, water features, and other contrasting elements often create emphasis.

**Site Location**

The site to which these designs were applied is bordered to the east by the foothills of the Wasatch Range and to the west by greasewood and alkali flats that frame the Great Salt Lake. It is roughly 8 ha (20 acres) in size, and is part of the Utah Botanical
Center (UBC). The site is located along the Wasatch Front near Kaysville, Utah (Figure 8). Figure 8 shows the most important factors observed during the site analysis. Running adjacent to the study site on the western edge is Interstate-15 (I-15), the primary transportation corridor along the Wasatch Front.
Figure 8. Utah Botanical Center, Kaysville, Utah. Study area site analysis.
Noise from I-15 carries well into the site despite berms created to mitigate this impact. Road noise can also be heard from the road bordering the site to the east, 50 West, that bisects the UBC property. The area within the site that is the least impacted by noise from I-15 and 50 West is found on the northern edge, at the interface with residential development and a small, vegetated buffer. Other noise impacting the site included those from a rail line running parallel to I-15 and frequent from air traffic. In this study, two separate vantage points were used to illustrate the general conditions and context of the site.

Figure 9 shows the proximity of the Wasatch foothills looking east across one of the ponds, and Figure 10 is an illustration looking northeast, showing the thin vegetated buffer that was kept intact at the interface with residences. The fallow grassland site, which is the center of the designs included in this thesis, is periodically tilled in an attempt to deplete the seed bank of invasive species (Figures 11 and 12). The study site is surrounded by residential development, which is a dominant visual component of the site (Figure 8), while in the middle distance, the mountains of the Wasatch Front are dominant (Figures 9 and 10). The study site is located within the eco-region known as the Intermountain Grassland, within the larger Great Basin region. The Great Basin region is surrounded to the east by the Wasatch Range, to the west by the Sierra Nevada Range and the moister landscape of the Pacific Northwest, and bordered to the south by the Mojave Desert. The drainage within the Great Basin is to the Great Salt Lake Basin is to the Great Salt Lake.
Figure 9. Site analysis-View 1, looking east across the pond shows wetland vegetation surrounding the pond area, encroaching suburban development, and the Wasatch Range in the background.

Figure 10. Site analysis-View 2, looking northeast shows fallow field characteristic of the site, surrounding suburban development and Wasatch foothills and mountains in the background.
Figure 11. Site analysis-View 3, looking north across fallow field. Note berms on the western side of view and surrounding suburban development on the boundaries of the UBC property.

Figure 12. Site analysis-View 4, looking across fallow field. Pond vegetation can be seen on the western edge of view.
Because the study site has been under agricultural cultivation for the last 100 years or so, information on native vegetation communities is primarily based on soil type and a general knowledge of pre-settlement vegetation. Bailey (1978) identified four primary vegetative types constituting the Great Basin grasslands: (1) Intermountain sagebrush, (2) sagebrush-wheatgrass, (3) Lahontan saltbrush-greasewood, and (4) Great Basin sagebrush. The chief vegetation (commonly referred to as sagebrush steppe) is composed of sagebrush (*Artemisia* ssp.) or shadscale (*Atriplex* ssp.) mixed with short grasses. Also common to the area, particularly closer to the Great Salt Lake are moist alkali flats that are dominated by alkali-tolerant greasewood (*Sarcobatus vermiculatus*) and inland saltgrass (*Distichlis spicata*). Along streams and near the mountains where water quality is good, valley bottoms were lined with cottonwoods (*Populus* ssp.), willows (*Salix* ssp.) and rushes and sedge species such as *Schoenoplectus acutus*, *Schoenoplectus americanus*, *Juncus* ssp. and *Eleocharis* spp. (Bailey 1995).

**Site History.** Conceptual drawings showing the possible scenario of changes in the landscape surrounding the UBC from the native shrub-scrub dominated landscape, to an agricultural area, to the current suburban use are presented in Figures 13, 14, 15. The native vegetation communities, hydrology and overall landscape qualities have been changed over time by human activity. After the arrival of the settlers (Mormon pioneers) in the mid-1800s, Kaysville became a farming community where hay, grains, cattle, vegetables, sugar beets, and cherry orchards were cultivated. With the beginning of World War II, and after the establishment of Hill Air Force Base and the Naval Supply Depot, a demand was created in the area for housing, and the Kaysville area began to
change from an agriculture community to a suburb. Steady growth has continued to the present time (Utah History Encyclopedia, 2011).

Figure 13. Possible distribution of native vegetation communities in the Kaysville area: Illustration based on the 1968 Soil Survey of Davis and Weber Counties. Species common to this area circa 1800 would have likely included sagebrush (*Artemisia* ssp.), rabbitbrush (*Ericameria* and *Chrysothamnus* ssp.) on the valley floor, gambel oak (*Quercus gambelii*) in the foothills, and willow (*Salix* spp.) and cottonwood (*Populus* spp.) lining stream channels.
Figure 14. Conversion of native vegetation communities to agricultural fields in the Kaysville area. This area was incrementally changed during the 1900s. The band of cottonwood and willow species lining small stream channels continued to narrow as the stream corridor was encroached upon as the surrounding landscape was plowed and planted with row crops, alfalfa, shrub species cleared and native and nonindigenous grass species established in the open ground.
Figure 15. Urban development pattern in Kaysville, Utah (2007). Currently, narrow, incised canals and streams have small, disconnected riparian forest habitat dominated by willow and cottonwood species. Development along the foothill region have encroached native gambel oak vegetation communities. Note the UBC study site in the lower portion of the illustration.
Prior to European settlement, as depicted in Figure 13, plant communities were likely dominated by gambel oak, sagebrush, and stream banks lined with willow and cottonwood galleries (Baily, 1978 and USDA SCS, 1968). Abundant water and high soil fertility drove conversion of native vegetation communities to agricultural use (Figure 14). Figure 15 illustrates the current urban occupation of the same area, showing residential development and transportation corridors. Urbanization has affected the entire Salt Lake Valley, from the foothills to the wetlands surrounding the Great Salt Lake. Perennial streams and associated riparian forests have been narrowed, channelized, incised and are diverted for irrigation purposes. To maximize land available for development, natural meanders once part of the larger flood plain, were forced into narrow corridors. Development has resulted in filled wetlands and shrub-scrub plant communities converted into first-farmed agricultural lands and eventually into urban and suburban housing developments. The green space within the urban and suburban Kaysville area is currently limited to parks, residential yards, and remnant agriculture fields. The following are the existing site elements important to document during the initial site assessment and to consider during development and implement a landscape design. These site elements can give cues to the history of the site and guide restoration processes and address potential challenges.

**Vegetation.** The vegetation on the study site is dominated by nonnative, invasive plant species, including redroot pigweed (*Amaranthus retroflexus*), field bindweed (*Convolvulus arvensis*), quackgrass (*Elymus repens*), johnsongrass (*Sorghum halepense*), and other weed species typical of disturbed landscapes abandoned following agricultural use.
Climate. The Great Basin includes a high-altitude variation of temperate desert climate, with a very pronounced drought season (Bailey, 1995). The region receives 60 percent of its annual precipitation during the winter months as snowfall, when plants are dormant. The mean annual temperature average is 50 degrees Fahrenheit (F), with an average temperature during the growing season of 74 degrees F, but it is not uncommon for temperatures to reach daily highs in the upper 90s. The average precipitation for the region is 400 mm (15.65 inches) (National Oceanic and Atmospheric Administration, 2012), most of which occurs in winter and early spring.

Soils. Soil types found within the Intermountain West are complex, and soil conditions change rapidly over just a few miles. Consequent to varied soil conditions, different vegetative communities form complex mosaics and islands in the Intermountain region (Fenneman, 1981). Depending on parent material, soils within this region are often alkaline; few are neutral and rarely acidic (Shelford, 1963). Aridisols, which are saline and/or alkaline soils low in organic matter, dominate all basin and lowland areas with narrow bands of entisols found in stream floodplains and rocky landscapes. These are relatively young soils not yet significantly influenced by environmental or plant interactions.

Soils data obtained for the study site (NRCS, 2012) indicate that the UBC is primarily characterized by soils within the Parleys loam (PaB) series. This soil type occurs within elevations ranging from 4,200 to 5,050 feet above mean sea level and primarily on lake terraces. Soil samples collected at the UBC during previous establishment research conducted by Atkin (2010) showed that the soils within the site are typical of the Parleys series, a well-drained, medium-textured, silty loam.
directly adjacent to ponded areas have been heavily compacted with clay added to aide in pond water retention during construction, traffic from farm and maintenance equipment, and foot traffic of recreational users. Soils used to construct the earth berms adjacent to I-15 were dredged from storm-water retention ponds located on the eastern boundary of the site. These soils are primarily fine silts and clays.

**Topography and Hydrology.** The project site is located in the relatively flat valley floor of the Salt Lake Valley. The slope ranges from 0 to 3 percent (USDA NRCS, 2012). Ground water is not near the surface of the vast majority of the site, typically more than 80 inches below grade, so the site would be classified as upland habitat. It is likely that prior to the urban development surrounding the study site there was no remaining surface water except following precipitation. Storms could have caused small ephemeral streams or filled topographic low points that served as transient water reservoirs and/or eventually drained to the nearby Great Salt Lake. Currently, two large storm water retention ponds are located on the eastern edge of the site. These ponds serve as a holding area for excess water from agricultural land east of and uphill from the ponds. The ponds were dredged between 2002 and 2004 to provide more suitable fish habitat and are used as a community recreational area for fishing stocked by the Division of Natural Resources (DWR, 2008). It should be noted that surface water was more prevalent within the area prior to development, as evidenced by the presence of willow- and cottonwood-lined streams that meandered toward the Great Salt Lake (Figure 13).
Design Expressions

In this study, a design parti was used to establish a central concept that served as a platform to compare the English-style design to the artistic native restoration design approach (Figure 16). The design parti illustrates the main components for organization based on circulation and formalized structure for the placement of plant species. This parti is an internal design structure that is not related or intended to be completely contextual or related to the existing master plan of the UBC. The designs explored in this chapter are schematic and are used to illustrate and compare concepts and are not intended to be read as design proposals to be implemented. The design expressions are organized and examined independently and then examined for the degree to which they relate, differ, and contrast with each other based on two sets of criteria: first, the design criteria cited by Nassauer (1988, 1995, 1997), Williams and Cary (2001), and Gobster et al. (2007), and second, on ecological function and value as defined by Alberti (2005) and

Figure 16. Design parti used as the central concept for the traditional and restoration design expressions and illustrates the main components for organization based on circulation and formalized structure for the placement of plant species.
Additionally, design intent, program, context, design considerations, and ecological value are analyzed. The design intent outlines the aesthetic and functional requirements of each expression. Objectives of the design expressions were met through the use of design elements structured by design principles and considerations, ecological understanding of the site and/or “cues to care” (Nassauer, 1995b). The program identified elements drawn from the analysis and ecological understanding of the site, with the plant palate as the driving force behind choices that are made for the site. Although not related or corresponding to the changing master plan of the UBC, site context discusses how each design “fits” into the surrounding landscape and how it might accommodate people within the community and/or wildlife by catering to respective needs and preferences. Elements and principles of design relevant to each expression were identified and explored during the design process. Specifically, designs focused on how a user (human and/or wildlife) can experience, utilize and benefit from design alternatives. Lastly, each design expression was rated by the potential ecological value that the approach could contribute to the local ecosystem. Design considerations and ecological value were used to draw direct comparisons among design expressions. Table 1 (found at the end of the design discussion) summarizes these comparisons.
**English-Style Design (Design I)**

**Design Intent.** This design expression embodies cultural landscape ideals adopted from previous generations and prominent landscape designers of the 1700s and 1800s. Although several centuries old, the English design motif has continued to be a part of the contemporary design repertoire. This expression includes the use of traditional design principles and is aimed at creating a landscape that meets social, practical, and aesthetic dimensions dictated by cultural preference.

**Program.** This design expression adapts approaches similar to those of Andrew Jackson Downing and Lancelot “Capability” Brown. The underlying theme of this design features smooth, gently undulating slopes of clipped lawn, well pruned shade trees, and a reduced palate of trees and shrubs available locally and commonly used in constructed landscapes in the Intermountain West. The plant species recommended for this English-style design include maple (*Acer* spp.), honey locust (*Gleditsia* spp.), cotoneaster (*Cotoneaster* spp.), privet (*Ligustrum* spp.), green ash (*Fraxinus pennsylvanica*), sycamore (*Plantanus* ssp.) and the turf species Kentucky bluegrass (*Poa pratensis*).

This design expression explores the cultural elements (i.e., human centered values) primarily with the use of non-native plant species that are locally preferred. This expression was designed with the sole intention of meeting the needs of human use and comfort. The design is intended to encourage social interaction, walking, jogging, biking, and casual pick-up games like soccer or football, as well as more passive or solitary activities such as people watching or meditation. Large areas in this type of
landscape must be planted with turf and managed intensely to accommodate many of the programmatic activities. These areas provide minimal ecological value because large areas of turf lack plant diversity and associated cover or forage for wildlife species. The turf will require relatively high use of water for irrigation, fertilizer to maintain desirable turf characteristics, and pesticides to control invasive broadleaf plants such as dandelions. These elements all adversely affect on-site ecology, runoff and groundwater quality. A plan view of the proposed English-style design expression as applied to the study site is presented in Figure 17. As Hiss (1990) stated, legibility is created by familiar elements within a landscape (i.e., clean lines, fences, pathways, and plantings); this design gives priority to legibility of space.
Figure 17. Plan view of English style design expression: English style design expression as applied to a site located at the Utah Botanical Center. Note the use of the simplified palate of plant species, broad expanses of lawn that borders ponded areas and long allée and border tree rows. The more intimate spaces created through the use of plantings, paths, and areas "designated" for contemplation, meditation, or reprieve from the broader landscape.
**Design Context.** The design approach was based on landscape values from previous generations with reference to Falk’s (1992) consideration of human preference for the grassy, tree sprinkled savannas of Africa. Strong English influences from the 19th Century, paired with our early human origins, have made this design approach common and popular. The simplified plant palate creating a landscape with qualities similar to human’s evolutionary origins helps to make users feel comfortable within the easily navigated, open landscape.

**Design Considerations**

**Spatial Character.** Dee (2001) stated that landscape architecture is essentially the organization and division of land, which results in spaces. Spaces within the proposed design expression are created by the use of structures, vegetation, water, topography and paths. In this case, the spaces are intended primarily for outdoor activities, emphasizing human use and experience.

A dominant feature of the design is the strong axial theme that forms the primary paths by which users access the broader site and secondary trails through the site to experience a sequence of spaces and views to distant landscapes. The axial paths are straight lines in the cardinal directions, north to south and west to east. The primary entrance to the site is located on the eastern boundary. This leads directly down an enclosed allée of trees to a formal fountain area. An orderly, concentric series of trees frame the area to create a formal setting within this space. The coolness of the water and the deep shade of the trees create a microclimate comfortable for users during the
daytime heat typical of an Intermountain West summer. Users have the option to move quickly through this area on the way to linger in and experience more intimate spaces created by encircling vegetation patterns along paths. Although smaller spaces are defined by vegetation and circulation, these spaces are still accessible, opening onto larger, more public spaces where athletic activities occur or can be observed. These smaller and more intimate spaces provide outposts within a larger-scale landscape that create a sense of protection while retaining simplified lines and familiar landscape elements. These spaces are meant to induce feelings of comfort, security, reassurance (Dee, 2001) and an enhanced ability to relate to one’s surroundings.

As stated by Dee (2001), paths play a crucial role in mediating and facilitating the experience and use of landscapes. In the proposed design, circulation throughout the study site has been enclosed with vegetation to create a sensation of rhythm as one travels down a particular path. Enclosure provided by vegetation periodically opens to allow users access to a desirable view of the surrounding landscape. Trees along the formalized paths, such as the axis of the allée (Figure 18), are consistently spaced to create an airy overhead plane. The evenly spaced, pruned tree trunks imply spatial enclosure that allows for views out to the larger landscape on either side. This design references Capability Brown’s design approach as popularized in the mid-1700s, and revisited in a more structured way in the Beaux Arts era of the late 1800s and early 1900s. The site design minimizes extemporaneous elements that would clutter views, resulting in clean, sweeping lines. The spaces between tree trunks enable users to drift off the hardened paths to open spaces of mowed lawns. The permeability of the line of trees allows the user to feel comfortable and safe within the landscape as views are unobstructed by low-
growing plant material and less likely to harbor elements that could be perceived as a threat (e.g., animals and/or other humans).

The open lawn expanses are intended to suggest vastness borrowed from adjacent landscapes, with a mountain backdrop on the horizon below an open sky. Lawn areas also maximize the potential for organized sports and traditional recreational uses. These areas are designed for group activities such as picnics, team sports as well as lounging and solitary moments at the vegetated edges. Transitional areas such as those found at the path nodes, as referenced in Figure 17, are intermediary spaces that provide protection from weather (i.e., wind, sun, light rain) and spaces for private meditation, lounging, and socialization.
The hilly topography on the western edge of the site provides a gentle degree of enclosure for the whole site. These topographic features gently lead the eye to the sky and screen motion and some of the noise from traffic on the I-15 corridor.

Water is a distinguishing feature of a landscape and is one of the most magnetizing and compelling of all design elements (Booth, 1990; Dee, 2001). In the English-style design, the existing ponds on the eastern edge of the site serve as a boundary (Figures 17 and 19) and create a dynamic sensory space because of their reflective properties, sound, and movement. The simplicity of the lawn transitions into the still, ponded water; this transition provides an uninterrupted view of the Wasatch Range to the east across the ponds.

*Figure 19.* English-style design expression: pond-upland boundary that forms a clean, distinct line separating the two elements of water and earth by using simplified plantings of lawn.
Movement/Paths. The objectives for the placement of paths and intended spatial experiences within this design expression are two-fold: first, to provide users with a direct route onto the site by use of the traditional formal allée design and second, to provide secondary paths that gently meander through the site for users to experience more “natural” or “organic” movement while exploring (Figure 20). The primary path or allée leads directly to the formal plaza and fountain area, which serves as a central node and focus of the site. This allée also provides access to other paths to move throughout the site. The strong axial design leads to a series of secondary nodes, each with a different spatial character, in which users have the option to remain on the primary path or choose to explore curvilinear paths that provide different experiences while traveling through the landscape. These paths are confined between the ponds to the east and berms

Figure 20. English-style design expression secondary path: meandering paths skirt the site to provide open views in all directions. Clean lines of the sidewalk and grass interface are punctuated by sheered hedges and trees in the background.
to the west. Undulating and serpentine paths (Figure 19) are meant to encourage freedom of movement to experience the open lawn areas and the pond’s edge as shown in Figures 17, 19, and 21.

The path surface of the axis is constructed of geometric shapes of concrete, which satisfies a human need for order; however, these shapes are placed randomly, which suggests more natural, organic spaces, paths, and experiences.

**Edges.** Edges are created primarily by landscape features and existing development (i.e. ponds, sidewalks, berms, residential development, I-15 corridor) and are softened with the use of vegetation. Within the site, edges are created or implied by both the placement of paths and vegetation (Figure 14). They are used to separate
expanses of lawn, reinforce intended corridors for movement, and as a softening buffer between harder built forms. The strong edge around the central plaza and fountain area is formed by concentric tree masses surrounding this area, reinforcing this space as the landscape’s focal point, while the meandering paths are “soft” and encourage deviation from the hardened path. This will provide guided movement for some users and desired freedom to others.

**Focus.** The site’s focus is the fountain in the central plaza (Figures 17 and 18). This serves as a destination visible from two main crossings, a point for orientation, and a traditional landscape element people can relate to and enjoy. Fountains are places where people have an inherent desire to gather, providing a medium for social interaction or private contemplation. Fountains celebrate water as a life-sustaining resource, and their exuberance draws people to interact and play (Dee, 2001). The plaza, punctuated with a fountain and surrounded by masses of trees, can be experienced during all seasons.

**Color, Texture, Form, and Repetition.** To capture the essence of the English-style design approach used by landscape designers and home gardeners, a simple palate of color, texture, and form was adopted within this design expression on the UBC site.

Plantings provide most of the structure and many of the details contained within this design expression. The design parti provides guidance for the placement of plants to create distinct lines within the landscape, giving form, structure and the creation of space and spatial hierarchy to the design. The plants selected create the feel of a highly structured oasis within a desert environment. The broad areas of irrigated turf and ornamental trees are intended to provide users with an experience of lush coolness. The
fine texture and consistent color of the turf unifies the site and is reinforced by simple texture and color throughout the landscape. The tree species selection was simplified to create an overall uniform and tidy landscape.

**Ecological Value Analysis**

The potential to contribute to the broader ecosystem of the region was reduced by simple, strongly defined edges, limited biodiversity, and the use of introduced ornamental plant species. Table 1 describes and rates the traditional design expression based on the scientific attributes established by SER (2004) to measure the success of restoration efforts. These include the consideration of reference ecosystems, the use of native species and of all functional groups to the greatest possible extent, sustainability of the site, functionality for stage of development, linkage to other native ecosystems, and resilience to stress. The overall reduction of biodiversity characterizing this design expression reduces the likelihood that the site will be used and occupied by diverse and beneficial insect species or by many species of native and migrant birds and larger animals.

Maintenance, energy requirements, and natural resource requirements for this type of landscape design are economically and environmentally costly. However, simple adjustments, such as replacement of introduced ornamental species with native species, reduced turf areas, and wetland buffers surrounding the ponds have the potential to greatly improve the site’s ecological health. Altering maintenance routines such as hand pulling weeds or biological controls rather than the use of herbicides for controlling undesirable species, reduced mowing and edging of lawn areas to allow insects and
wildlife to use seeds and cover, can also greatly improve the site’s ecological health and reduce energy inputs required to meet cultural expectations for landscape aesthetics.

Table 1

<table>
<thead>
<tr>
<th>Attributes used to measure restoration success</th>
<th>English-style design approach assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Contains characteristics of reference ecosystem</td>
<td>A reference ecosystem was not considered as part of the design methodology</td>
</tr>
<tr>
<td>2) Contains native plant species to the greatest possible extent</td>
<td>No species native to the Intermountain region were used within the planting plan prescribed within this design</td>
</tr>
<tr>
<td>3) Contains all vegetation functional groups (e.g. grass, forb, legume, woody species) for continued development/stability</td>
<td>Planting plan utilized species from various functional group, including, grass, forb, and woody species</td>
</tr>
<tr>
<td>4) Physical environment of restored ecosystem capable of sustaining reproducing populations</td>
<td>Design approach utilized species that are not adapted to the region and not likely to survive without supplemental irrigation</td>
</tr>
<tr>
<td>5) Functions normally for its ecological stage of development</td>
<td>Introduced vegetation community is primarily static with species selection and maintenance standards</td>
</tr>
<tr>
<td>6) Integrated into larger ecological matrix or landscape</td>
<td>Habitat created was not consistent with the native plant communities of the region. The habitat is, however, consistent with the landscape practices typical of the surrounding urbanized area</td>
</tr>
<tr>
<td>7) Threats to integrity from surrounding landscape have been eliminated</td>
<td>The integrity of this site is not threatened by the surrounding development</td>
</tr>
<tr>
<td>8) Resilient to endure periodic stress events</td>
<td>Not likely to survive without supplemental irrigation or other natural stress events such as fire</td>
</tr>
</tbody>
</table>
Table 1 (continued)

<table>
<thead>
<tr>
<th>Attributes used to measure restoration success</th>
<th>English-style design approach assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>9) Self-sustaining to the same degree of its reference ecosystem</td>
<td>Not applicable, no reference system used</td>
</tr>
</tbody>
</table>

**Basic Restoration (Design II)**

**Design Intent.** This design expression is based on scientific measurements of success, primarily the site’s ability to sustain life over a long period of time, as suggested by Alberti (2005) and expressed as the reestablishment of two historic native plant communities. In other words, this design at this site should be self-perpetuating and resilient with little or no human intervention. As previously discussed, the focus of this thesis is plant communities and the consideration of key components (primary production, biodiversity, function, structure and change) to define restoration success.

The fundamental premise of the restoration design expression is the establishment of a plant community that is as similar as possible to what was on this site prior to European settlement and subsequent human impact. This includes the use of native species to the greatest possible extent, including a diversity of functional groups (grass, forb, legumes, woody trees and shrubs). As the native vegetation communities become established, the site will require minimal maintenance and decreasing control of invasive plant species. Native species will be better able to complete their life cycles, creating a
self-perpetuating system similar to less-disturbed ecosystems found in the region that will be resilient if disturbed.

**Program.** The program outline for this design will discourage human use or intervention while maximizing potential value to wildlife and other environmental benefits such as erosion control and improved water and air quality. The site will contribute to and improve the area’s overall environmental health by establishing a diverse palette of native species that will eventually be used by various insect, bird, and small mammal species to form a viable community. The plant materials used in this design expression comprise two plant communities that were once common to the region. The first of these communities is upland flora dominated by sagebrush (*Artemisia* species) and bitterbrush plus associated grass and forbs species, recreating the sagebrush grassland plant community that would have inhabited this site more than a hundred and fifty-years ago. A plan view of the proposed traditional restoration expression as applied to the study site is presented in Figure 22. A comprehensive recommended plant species list for the establishment of a native upland plant community is provided in Table 2.

Secondly, wetland communities surrounding the ponds would include emergent marsh, wet meadow and riparian woodland habitat types. A recommended plant list is found in Table 3 for the three wetland habitat types that are expected to be established with proper grading, placement of top soil materials, and some cases, seeding areas surrounding the ponds. The species list recommended for restoration of this site includes plant species that are commonly distributed in and around the project site’s region as described by Albee, Shultz and Goodrich, (1988) and are typically found at this elevation.
(see Welsh, Atwood, Goodrich, & 2003). General species characteristics such as form and seasonal interest are provided as per Mee, Barnes, Kjelgren, Sutton, Cerny, and Johnson. (2003).

**Design Context.** The genius loci of the place was recreated by understanding the site’s natural history and by attempting to recreate and represent ecosystems that were once common within that area. Key elements used to create the proposed natural and native landscape include criteria outlined by the Society for Ecological Restoration (SER, 2004) as well as those developed by plant ecologists and restoration specialists (Alberti, 2005; Ruiz-Juan and Aide, 2005; Diaz, 2005; Holling, 2001; Peterson et al., 1998).
Figure 22. Plan view of basic restoration design expression. Ponded areas are surrounded by wetland habitat that includes emergent marsh, wet meadow, and riparian woodland. The upland areas were planted with sagebrush-grassland species.
Table 2

Upland Species List for Basic Restoration Design Expression.

<table>
<thead>
<tr>
<th>Botanical name</th>
<th>Common name</th>
<th>Habit and general characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shrub/Woody Species:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Artemisia frigida</em></td>
<td>Fringed sage</td>
<td>Native perennial herb or subshrub; creosote bush to alpine communities</td>
</tr>
<tr>
<td><em>Artemisia tridentata</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>subsp. <em>tridentata</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Artemisia tripartite</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ssp <em>tripartite</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Ericameria nauseosa</em></td>
<td>Rubber rabbitbrush</td>
<td>Native shrub, important sagebrush community component; early successional</td>
</tr>
<tr>
<td><em>Gutierrezia sarothrae</em></td>
<td>Broom snakeweed</td>
<td>Native shrub; creosote bush, sagebrush, rabbitbrush pinyon-juniper communities; early successional</td>
</tr>
<tr>
<td><em>Purshia tridentata</em></td>
<td>Antelope bitterbrush</td>
<td>Much branched shrub; sagebrush and mountain brush communities; important for deer</td>
</tr>
<tr>
<td><strong>Grass Species:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Achnatherum lettermanii</em> Achnatherum lettermanii</td>
<td>Letterman’s needlegrass</td>
<td>Native perennial, often dominant grass; salt desert shrub to mountain brush communities</td>
</tr>
<tr>
<td><em>Elymus elymoides</em></td>
<td>Bottlebrush squirreltail</td>
<td>Native perennial; tolerant of dry to moist sites; salt desert scrub to alpine grassland communities</td>
</tr>
<tr>
<td><em>Festuca ovina</em></td>
<td>Sheep fescue</td>
<td>Circumboreal perennial, often dominant grass; sagebrush to conifer communities</td>
</tr>
<tr>
<td><em>Leymus cinereus</em></td>
<td>Basin wildrye</td>
<td>Native perennial; along waterways and roadsides, wet meadows, openings in sagebrush to conifer communities</td>
</tr>
<tr>
<td><em>Pseudoroegneria spicata</em></td>
<td>Bluebunch wheatgrass</td>
<td>Native perennial; sagebrush, pinyon-juniper, mountain brush, aspen, ponderosa and spruce-fir communities</td>
</tr>
<tr>
<td>ssp. <em>spicata</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Stipa comata</em></td>
<td>Needle-and-thread grass</td>
<td>Tuften perennial, often glaucous; primarily found in desert shrub communities</td>
</tr>
<tr>
<td>Botanical name</td>
<td>Common name</td>
<td>Habit and general characteristics</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td><em>Achillea millefolium</em> var. <em>occidentalis</em></td>
<td>Western yarrow</td>
<td>Native, perennial herb; sagebrush to alpine tundra communities</td>
</tr>
<tr>
<td><em>Artemisia ludoviciana</em></td>
<td>Prairie sage</td>
<td>Native perennial herb; creosote bush to alpine communities</td>
</tr>
<tr>
<td><em>Balsamorhiza sagittata</em></td>
<td>Arrowleaf balsamroot</td>
<td>Native perennial herb; sagebrush to conifer communities, clumping, basal vegetation w/ flowering stems</td>
</tr>
<tr>
<td><em>Castilleja linariifolia</em></td>
<td>Narrowleaf or Wyoming Indian paintbrush</td>
<td>Desert shrub to aspen-conifer communities; stems simple or branched, 7-31-inches tall</td>
</tr>
<tr>
<td><em>Lupinus argenteus</em></td>
<td>Silverleaf lupine</td>
<td>Grass-sagebrush to alpine ridges; purple blooms, clumping habit</td>
</tr>
<tr>
<td><em>Lupinus sericeus</em></td>
<td>Silky lupine</td>
<td>Sagebrush, pinyon-juniper to ponderosa pine, aspen, spruce-fir communities; purple blooms, clumping to spreading habit</td>
</tr>
<tr>
<td><em>Oenothera pallida</em></td>
<td>White evening primrose</td>
<td>Native annual or perennial; sand dunes, disturbed sites in creosote bush to ponderosa pine communities; erect branching stems 4 to 27-inches tall</td>
</tr>
<tr>
<td><em>Sphaeralcea munroana</em></td>
<td>Munro’s globemallow</td>
<td>Native perennial herb; shadscale, desert shrub, juniper, mountain brush communities, several to many stems 7 to 27-inches tall</td>
</tr>
</tbody>
</table>
Table 3
Wetland and Riparian Forest Planting Recommendations – Basic Restoration Design: Emergent marsh, wet meadow seeding and pole planting recommendations for the basic restoration design expression

<table>
<thead>
<tr>
<th>Basic Restoration Expression Plant List and Species Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Emergent Marsh</strong></td>
</tr>
<tr>
<td>Botanical name</td>
</tr>
<tr>
<td><em>Schoenoplectus acutus</em></td>
</tr>
<tr>
<td><em>Schoenoplectus americanus</em></td>
</tr>
<tr>
<td><em>Schoenoplectus pungens</em></td>
</tr>
<tr>
<td><strong>Wet Meadow:</strong></td>
</tr>
<tr>
<td><em>Carex nebrascensis</em></td>
</tr>
<tr>
<td><em>Carex praegracilis</em></td>
</tr>
<tr>
<td><em>Eleocharis palustris</em></td>
</tr>
<tr>
<td><strong>Riparian Woodland</strong></td>
</tr>
<tr>
<td><em>Crataegus douglasii</em></td>
</tr>
<tr>
<td><em>Populus angustifolia</em></td>
</tr>
</tbody>
</table>
Table 3 (continued)

<table>
<thead>
<tr>
<th>Botanical name</th>
<th>Common name</th>
<th>Habit and general characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Populus fremontii</em></td>
<td>Fremont cottonwood</td>
<td>Native tree; found along rivers and streams; 50 to 60-feet in height; spreading habit</td>
</tr>
<tr>
<td><em>Salix boothii</em></td>
<td>Booth’s willow</td>
<td>Native shrub, found along streams and wet meadows; 6 to 12-feet tall; dense, multi-stemmed</td>
</tr>
<tr>
<td><em>Salix exigua</em></td>
<td>Narrowleaf willow</td>
<td>Native shrub, found along waterways, marshes, near seeps and springs, wet pastures and fields; salt tolerant; multi-stemmed</td>
</tr>
<tr>
<td><em>Salix lucida</em></td>
<td>Shining willow</td>
<td>Native shrub to small tree; found in riparian and palustrine (inland marsh) habitats</td>
</tr>
</tbody>
</table>

**Design Considerations**

**Spatial Character.** The primary open space, which is the same for all of the proposed designs, is dominated by low growing grass, shrub and forb species. The species selected for the site are exclusively native to the region, well within the known area of species adaptation. The open space (Figure 22) is defined to the west by berms and to the east, by the ponds and a tree line. The ponds and the surrounding wetland vegetation create a secondary space. Design considerations were intentionally not applied to the basic restoration design expression because human use and aesthetic appreciation are not the goal of this design. The intent is to foster an ecosystem that is driven by natural successional process using adapted native plant materials and protected by limiting human access, thus maximizing opportunities for wildlife to use the site for foraging for food, shelter, and possibly rearing of young. The visual aspect of the design
observed by visitors to the site will reflect the soils, topography, microclimate and plant-to-plant interactions.

**Movement/Paths.** The basic restoration design expression does not include improved paths for humans except along the eastern periphery next to the road; however no doubt fishermen will develop informal paths. The intent is for the site to provide food, cover, water, and other welfare requirements for wildlife and for human use to be secondary and incidental.

**Edges.** Edges within this design expression are limited to existing development (i.e., ponds, roadways, berms, residential development, and the I-15 corridor) and are softened with the reestablishment of native plant communities, particularly along the perimeter of the ponds. The proposed edges within the site are created solely with the use of vegetation as upland habitat transitions to mesic (i.e. moderately wet soils) and then to wetland habitat. These transitional ecotones (the transitional spaces between two habitats, plant communities or biomes) provide refuge for wildlife and visual interest between UBC use areas.

**Focus.** The focal feature of the site is the pond area, not by design, but because the ponds are the most distinctive landscape features on the site, and will continue to draw fishermen and curious visitors to the banks. The ponds are further emphasized with the large trees and dense vegetation that line the perimeter.
**Color, Texture, Form, and Repetition.** To capture the essence of what was likely present prior to grazing, cultivation, and eventual modern development, native plant species were used within this design approach. The color, texture, and form contributed by the native plant communities contrast with the backdrop of the Wasatch Range to the east. Sagebrush species dominate upland habitat and the characteristic blue-sage color forms the canvas, with seasonal flashes of purple, orange, white and yellow as perennials bloom and fade within the landscape. The vegetation is comprised nearly exclusively of species that exhibit finely textured foliage to minimize water use and discrete blooms, to give the optical illusion that the site is larger than it actually is. The species selected are low growing and irregularly shaped, atypical of highly managed landscapes where plants are pruned, shaped, and thinned to provide regular structure and form. The repetitive use of plants with similar form, color, and size creates a harmonious composition despite the lack of typical maintenance practices.

**Ecological Value Analysis**

The basic restoration design expression is designed to maximize the site’s ecological value as defined by SER’s (2004) attributes for ecological success. This site contains five primary habitat types: open water, riparian woodland, emergent marsh, grassland/shrubland, and shrub-scrub habitat (Figure 23). Plant communities that are contiguous can provide greater value to wildlife through increased area dedicated to habitat and by limiting human presence (Figures 24 and 25) by excluding paths and other features commonly used to invite human use. The absence or limited presence of humans within the area should be more appealing to a greater diversity of wildlife. With the elimination of
paved paths and other familiar built landscape elements, use of the site by humans will be minimized. By relying on plant succession and a richer plant palate, this expression may help the site to return to a more natural trajectory of plant community development. Table 4 discusses and rates this design expression based on the criteria established by SER (2004). These include the consideration of reference ecosystems, the inclusion of native species and utilization of all functional groups to the greatest possible extent, sustainability of the site, functionality for stage of development, linkage to other native ecosystems, and resilience to stress.
Figure 23. Basic Restoration Habitat Types. There are five primary habitat types found within the basic restoration design. These include shrub-scrub, shrub and grassland matrix, emergent marsh and wet meadow, riparian forest, and open water habitat.
Figure 24. Basic restoration design expression allows for vegetation around pond: continuous vegetation communities surround the pond areas and help to maximize wildlife habitat through layered vegetation, and a variety of plant species will increase cover and food sources.

Figure 25. Basic restoration design allows vegetation communities develop on a more natural trajectory with minimal influence from human uses. Dense, unfragmented habitat with multiple layers of vegetation provides food and cover for wildlife.
Table 4
SER Assessment of the Basic Restoration Design – assessment of the basic restoration design approach as it relates to attributes used to measure restoration success as defined by SER (2004).

<table>
<thead>
<tr>
<th>Basic Restoration Ecological Assessment (SER, 2004)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attributes used to measure restoration success</strong></td>
</tr>
<tr>
<td>1) Contains characteristics of reference ecosystem</td>
</tr>
<tr>
<td>2) Contains native species to the greatest possible extent</td>
</tr>
<tr>
<td>3) Contains all functional groups for continued development/stability</td>
</tr>
<tr>
<td>4) Physical environment of restored ecosystem capable of sustaining reproducing populations</td>
</tr>
<tr>
<td>5) Functions normally for its ecological stage of development</td>
</tr>
<tr>
<td>6) Integrated into larger ecological matrix or landscape</td>
</tr>
<tr>
<td>7) Threats to integrity from surrounding landscape have been eliminated</td>
</tr>
<tr>
<td>8) Resilient to endure periodic stress events</td>
</tr>
<tr>
<td>9) Self-sustaining to the same degree of its reference ecosystem</td>
</tr>
</tbody>
</table>
Artistic Restoration Design (Design III)

**Design Intent.** This design expression is based on criteria that support ecological restoration success as well as providing the aesthetic and functional requirements of a landscape design. This expression integrates Lyle’s (2002) ideal that landscape form is the expression of process. The site’s inherent ecological processes and cultural aesthetic needs will dictate the design approach within this expression. The intent is to create ecological value while meeting cultural aesthetic preferences.

**Program.** The proximity to residential and commercial developments and the public nature and ownership of this site makes public use desirable. It therefore should be designed for a wide range of human activities. There are two main design goals for this expression. The first goal of this design is to facilitate activities such as social interaction and recreation (walking, jogging, biking), people watching, meditation, wildlife viewing, fishing, and educational activities. The second goal is to contribute to the area’s diversity of flora and fauna, provide habitat for insects and wildlife, minimize resources required to implement and maintain the site, and provide an example of the desirable features of a regionally unique landscape character.

Aesthetic considerations for the site are derived from regionally unique qualities. The concept of regional authenticity suggests that a site will be designed to include plant communities historically indigenous to the site, demonstrating to the user that one is experiencing a landscape that is specific to the Intermountain West. The design principles suggested by Gobster et al. (2007), Hiss (1990), Nassauer (1995b) and Dee (2001) will be applied. Nassauer (1995b) specifically emphasizes “cues to care,” which
can be achieved by framing ecologically productive landscapes (Table 5). Gobster et al. (2007) suggest these “cues” invite human involvement. Hiss (1990) states that legibility is created by familiar elements within a landscape (i.e., clean lines, fences, pathways, and plantings). These provide structure and define how humans interact with a landscape by directing movement.

Table 5
Cues to Care for Legibility – elements that aide in the positive perception of ecologically functioning landscapes, as per Hiss (1990), Nassauer (1995b), and Gobster et al. (2007)

<table>
<thead>
<tr>
<th>Care/Action:</th>
<th>Cues present within the Artistic Restoration Design Expression:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Mowing</td>
<td>Grasslands will be periodically mowed and/or burned to avoid decadent (overgrown) stands of grass</td>
</tr>
<tr>
<td>2) Flowering plants</td>
<td>Rich palate of native, flowering, forb species</td>
</tr>
<tr>
<td>3) Wildlife feeders &amp; houses</td>
<td>Not applicable as this did not address design elements at this fine of scale</td>
</tr>
<tr>
<td>4) Bold patterns</td>
<td>Broad swaths and massing of plantings of individual native species</td>
</tr>
<tr>
<td>5) Trimmed shrubs and linear planting designs</td>
<td>Design features linear plantings of trees and shrubs to create legibility of circulation and establish spatial character</td>
</tr>
<tr>
<td>6) Fences, architectural details</td>
<td>Learning center, paved paths, and bridges dot the site to provide users with “signposts” (Nassauer, 1995a) to indicate how the site can be used</td>
</tr>
<tr>
<td>7) Foundation plantings</td>
<td>N/A</td>
</tr>
</tbody>
</table>
This design expression combines elements of the traditional (i.e., English-Style) landscape design and the basic restoration design, including cues to care, elements of legibility and restoration practices that respond to the ecological criteria identified by Alberti (2005), SER (2004), and others. In addition, the design fundamentals used reiterate the aesthetics found within the Intermountain West. Plant communities for this design expression are characterized by dominant native tree or shrub species such as gambel oak (*Quercus gambelii*), sagebrush (*Artemisia* spp.), rabbitbrush (*Chrysothamnus nauseosus*), and a diverse palate of native forb and grass species, which are included to bolster biodiversity and appeal to human aesthetic appreciation for blooming plants. A comprehensive upland plant list can be found in Table 6. Figure 26 is a plan view of the artistic restoration design expression as applied to the study site.

**Design Context.** By understanding the site’s natural history and by realizing the ecological potential of the site, and integrating human participation and aesthetic expectation creates the genius loci of a place. This design expression is also an effort to create a tamed, self-consciously designed expression of the original more natural place and invite human participation by addressing three main criteria:

1) Using key restoration elements to successfully create a natural and native landscape (SER, 2004; Alberti, 2005; Ruiz-Jaen and Aide, 2005; Diaz 2005; Holling, 2001; Peterson and Hollings, 1998),

2) Including landscape design elements related to cultural preferences as outlined by Gobster et al. (2005), Dee (2001), Nassauer (1995b), and Hiss (1990),
3) Implementing design elements to create a landscape that is comfortable and pleasing to humans as well as ecologically productive.

These criteria are later used as a metric to evaluate how well the design addresses cultural preference. By combining these approaches, the design will create a landscape that is rich in detail, biodiversity, and interest, and result in a greater depth of human experience while contributing to the larger ecological fabric.

Table 6
Artistic Restoration Design Expression Upland Plant List and Species Characteristics – Table shows woody, grass and forb species used within the upland habitat

<table>
<thead>
<tr>
<th>Botanical name</th>
<th>Common name</th>
<th>Habitat and general characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shrub/Woody Species:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Artemisia frigida</em></td>
<td><em>Fringed sage</em></td>
<td>Native perennial herb or sub-shrub; creosote bush to alpine communities; delicate foliage, soft sage green color</td>
</tr>
<tr>
<td><em>Artemisia tridentata</em></td>
<td>Basin big sagebrush</td>
<td>Native shrub; shrub desert communities to timberline; standard component to native western landscapes, irregular habit and potentially the tallest of western sagebrush spp. at 5-6 feet tall</td>
</tr>
<tr>
<td><em>Artemisia tripartite</em></td>
<td>Three-tip sagebrush</td>
<td>Native shrub; sagebrush and mountain brush communities; resprouts readily after fire or cutting; compact and dense w/ brighter sage green foliage</td>
</tr>
<tr>
<td><em>Ericameria nauseosa</em></td>
<td>Rubber rabbitbrush</td>
<td>Native shrub, important sagebrush community component; early successional; compact to sprawling habit, bright yellow blooms in fall</td>
</tr>
<tr>
<td><em>Gutierrezia sarothrae</em></td>
<td>Broom snakeweed</td>
<td>Native sub-shrub; creosote bush, sagebrush, rabbitbrush pinyon-juniper communities; early successional; compact habit with yellow blooms, fine bright green leaves</td>
</tr>
<tr>
<td><em>Purshia tridentata</em></td>
<td>Antelope bitterbrush</td>
<td>Much branched shrub; sagebrush and mountain brush communities; irregular habit due to browsing; profuse yellow blooms in spring</td>
</tr>
</tbody>
</table>
Table 6 (continued)
Artistic Restoration Design Expression Upland Plant List and Species Characteristics

<table>
<thead>
<tr>
<th>Botanical name</th>
<th>common Name</th>
<th>Habitat and general characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Acer grandidentatum</strong></td>
<td>Bigtooth maple</td>
<td>Native tree, multi-stemmed and rounded to spreading; often co-dominant with Quercus gambelii; mountain brush communities, stream banks, mesic slopes; great fall color (red, pink, yellow, orange)</td>
</tr>
<tr>
<td><strong>Quercus gambelii</strong></td>
<td>Gambel oak</td>
<td>Native tree or shrub; dominant over large areas, a major component of the mountain brush community; sagebrush to aspen, pinyon-juniper, ponderosa pine communities; wide spreading habit, moderate fall color (orange)</td>
</tr>
<tr>
<td><strong>Amelanchier utahensis</strong></td>
<td>Utah serviceberry</td>
<td>Native low to large shrub with rounded top; major component of mountain brush community; streamside, dry slopes in creosote bush to mountain brush, pinyon-juniper, ponderosa pine communities; white spring blossoms, fall color (orange to red)</td>
</tr>
<tr>
<td><strong>Ceratoides lanata</strong></td>
<td>Winterfat</td>
<td>Native shrub; creosote bush, shadscale, desert shrub, sagebrush, pinyon-juniper communities; wooly attractive evergreen</td>
</tr>
<tr>
<td><strong>Cercocarpus montanus</strong></td>
<td>Alderleaf mountain mahogany</td>
<td>Native shrub, a major component of the mountain brush community; dry, often rocky slopes, sagebrush to ponderosa pine communities; irregular habit but dense and symmetrical under cultivation</td>
</tr>
<tr>
<td><strong>Fallugia paradoxa</strong></td>
<td>Apache plume</td>
<td>Native shrub, dry washes in desert shrub to pinyon-juniper communities; white blooms and showy feathery seed heads</td>
</tr>
<tr>
<td><strong>Juniperus scopulorum</strong></td>
<td>Rocky Mountain juniper</td>
<td>Native tree; mountain brush, ponderosa pine, aspen communities, often streamside; evergreen, can be symmetrical, pointed, pyramidal single stemmed- or irregular and multi-branching</td>
</tr>
</tbody>
</table>
Table 6 (continued)
Artistic Restoration Design Expression Upland Plant List and Species Characteristics

<table>
<thead>
<tr>
<th>Botanical name</th>
<th>Common name</th>
<th>Habitat and general characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grass Species:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Achnatherum lettermanii</em></td>
<td>Letterman’s needlegrass</td>
<td>Native perennial, often dominant grass; salt desert shrub to mountain brush communities</td>
</tr>
<tr>
<td><em>Elymus elymoides</em></td>
<td>Bottlebrush squirreltail</td>
<td>Native perennial; tolerant of dry to moist sites; salt desert scrub to alpine grassland communities</td>
</tr>
<tr>
<td><em>Festuca ovina</em></td>
<td>Sheep fescue</td>
<td>Circumboreal perennial, often dominant grass; sagebrush to conifer communities</td>
</tr>
<tr>
<td><em>Leymus cinereus</em></td>
<td>Basin wildrye</td>
<td>Native perennial; along waterways and roadsides, wet meadows, openings in sagebrush to conifer communities</td>
</tr>
<tr>
<td><em>Pseudoroegneria spicata ssp. spicata</em></td>
<td>Bluebunch wheatgrass</td>
<td>Native perennial; sagebrush, pinyon-juniper, mountain brush, aspen, ponderosa and spruce-fir communities</td>
</tr>
<tr>
<td><em>Stipa comata</em></td>
<td>Needle-and-thread grass</td>
<td>Tufted perennial, often glaucous; primarily found in desert shrub communities</td>
</tr>
<tr>
<td><em>Achnatherum speciosum</em> **</td>
<td>Desert needlegrass</td>
<td>Native perennial; Joshua tree to pinyon-juniper communities in southern Utah; narrow panicle branches erect or ascending, twisted and densely hairy</td>
</tr>
<tr>
<td><em>Bouteloua gracilia</em> **</td>
<td>Blue grama</td>
<td>Native perennial grass; salt desert shrub to ponderosa pine communities central to southern Utah; bunch grass, densely tufting sometimes mat forming</td>
</tr>
<tr>
<td><em>Schizachyrium scoparium</em> **</td>
<td>Little bluestem</td>
<td>Native perennial grass; along waterways, in rock crevices and in desert shrub, pinyon-juniper ponderosa pine and hanging garden communities; glaucous or purplish color bunch, tufted habit</td>
</tr>
<tr>
<td>Botanical name</td>
<td>Common name</td>
<td>Habitat and general characteristics</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-----------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Forb/Legume Species:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Achillea millefolium</em> var. occidentalis*</td>
<td>Western yarrow</td>
<td>Native, perennial herb; adapted to a wide range of habitats including sagebrush to alpine tundra communities</td>
</tr>
<tr>
<td><em>Artemisia ludoviciana</em></td>
<td>Prairie sage</td>
<td>Native perennial herb; creosote bush to alpine communities</td>
</tr>
<tr>
<td><em>Balsamorhiza sagittata</em></td>
<td>Arrowleaf balsamroot</td>
<td>Native perennial herb; sagebrush to conifer communities, clumping, basal vegetation w/ flowering stems</td>
</tr>
<tr>
<td><em>Castilleja linariifolia</em></td>
<td>Narrowleaf or Wyoming Indian paintbrush</td>
<td>Desert shrub to aspen-conifer communities; stems simple or branched, 7-31-inches tall</td>
</tr>
<tr>
<td><em>Lupinus argenteus</em></td>
<td>Silverleaf lupine</td>
<td>Grass-sagebrush to alpine ridges; purple blooms, clumping habit</td>
</tr>
<tr>
<td><em>Lupinus sericeus</em></td>
<td>Silky lupine</td>
<td>Sagebrush, pinyon-juniper to ponderosa pine, aspen, spruce-fir communities; purple blooms, clumping to spreading habit</td>
</tr>
<tr>
<td><em>Oenthera pallida</em></td>
<td>White evening primrose</td>
<td>Native annual or perennial; sand dunes, disturbed sites in creosote bush to ponderosa pine communities; erect branching stems 4 to 27-inches tall</td>
</tr>
<tr>
<td><em>Sphaeralcea munroana</em></td>
<td>Munro’s globemallow</td>
<td>Native perennial herb; shadscale, desert shrub, juniper, mountain brush communities, several to many stems 7 to 27-inches tall</td>
</tr>
<tr>
<td><em>Epilobium angustifolium</em>*</td>
<td>Fireweed</td>
<td>Perennial herb; sesic sites in mountain brush to alpine meadow communities; stems decumbent to erect 2-4 feet tall w/ bright pink flowers</td>
</tr>
</tbody>
</table>
Table 6 (continued)

Artistic Restoration Design Expression Upland Plant List and Species Characteristics

<table>
<thead>
<tr>
<th>Botanical name</th>
<th>Common name</th>
<th>Habitat and general characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Forb/Legume Species:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Eriogonum brevicaule</em>*</td>
<td>Shortstem buckwheat</td>
<td>Native perennial herb; dry open sites in mountain brush communities to above timberline; short stems w/ inflorescence of yellow to cream, white or pinkish flowers</td>
</tr>
<tr>
<td><em>Eriogonum racemosum</em>*</td>
<td>Pink smoke buckwheat</td>
<td>Native perennial herb; mountain brush to ponderosa pine communities; 6-39 inches tall w/ leafless flowering stems; flowers white pink rose or scarlet</td>
</tr>
<tr>
<td><em>Gaillardia aristata (G. pulchella)</em>*</td>
<td>Blanketflower</td>
<td>Native perennial herb; pinyon-juniper, ponderosa, aspen, lodgepole pine, and spruce-fir communities; clumping with large showy yellow-orange flowers</td>
</tr>
<tr>
<td><em>Gaura coccinea</em>*</td>
<td>Scarlet gaura</td>
<td>Native perennial herb; creosote bush, Joshua tree, blackbrush, shadscale, juniper, mixed mountain brush, and sagebrush communities; clustered, clump forming w/ thin stems 1-2 feet tall; flowers along raceme, pink to salmon</td>
</tr>
<tr>
<td><em>Mirabilis multiflora</em>*</td>
<td>Showy four o’clock</td>
<td>Long lived perennial herb; creosote bush, blackbrush, and pinyon-juniper communities; clumping to spreading, spawling stems with funnel to bell-shaped flowers; pink, purple and magenta blooms</td>
</tr>
</tbody>
</table>

*Species were utilized in both the traditional restoration expression and the restoration design expression. **Species were used only in the restoration design expression to supplement the species found in the traditional restoration.
Figure 26. Plan view artistic restoration design expression.
Design Considerations

The same design parti (Figure 16) used for the English-style design expression was used for the artistic restoration design expression. The design parti provided organization primarily for circulation and creating a formalized structure for plant placement. The same parti introduced earlier in chapter was used for both the English-style design expression and the artistic restoration design expression to more accurately compare the two approaches by referencing the design plan. While some functional attributes of each expression are similar, such as circulation and paths, users will have very different spatial and aesthetic experiences. The user base is broader in this expression, considering both human and wildlife uses. Energy requirements are reduced with the elimination of traditional lawn plantings, which in turn will reduce maintenance, fertilizer and pest control.

Spatial Character. The spaces created by plantings, topography and paths are designed to accommodate uses by both humans and wildlife. Vegetation that frames different spaces contains layers of native plants to provide food and cover for insects, birds, and animals. Human users are led through the site experiencing a sequence of spaces ranging from a formal plaza area to intimate seating areas found along the trail system. The site’s primary entrance is on the eastern boundary and left open, with low-lying vegetation surrounding the area. The entrance is designed to invite and lead users to participate in the landscape and to propel users directly down an allée that is
rhythmically enclosed by native trees and shrubs. The allée is framed with grassland forbs and grasses leading to a formal fountain area. An intimate setting is created within the fountain area by the orderly concentric massing of trees and shrubs, which frame this space (Figures 27 and 28). The water and the deep shade of the trees and shrubs create a cool microclimate during the summer heat typical of the Intermountain West. Users have the option to continue on or to linger and enjoy this primary space created by encircling vegetation patterns. Smaller spaces are placed along the gently undulating paths on the northern half of the site. It should be noted that the allée is more enclosed when compared to spaces created for the English-style design expression due to layers of different plant species and the density that this in turn creates. However, openings across grasslands are strategically placed to capitalize on diverse views. Occasionally, smaller spaces with benches, the hard surfaces for paths, drinking fountains, and small patches of mowed grass are included with the intent to humanize the scale and provide a richer and more diverse environment. These elements can create a more protected environment and give a sense of human scale and suggest human presence and use (Figure 29).

The majority of paths throughout the study site are framed with vegetation to create rhythm for the user in the experience of walking a particular path. Unique, secondary spaces are created with the variation of size with native trees, shrubs, forbs and grasses for wildlife to forage, occupy, and use for cover. Trees and shrubs along the more formalized paths, such as the axis of the allée, are consistently spaced to create a cadenced yet open overhead plane while being visually permeable on either side (Figure 28). Periodic openings of trees and shrubs also enable users to drift off the built path beyond to open grasslands.
Figure 27. Design foci of artistic restoration design: plan view of design foci with fountain and concentric plantings of gambel oak, rabbitbrush, and sagebrush massings.

Figure 28. Artistic restoration design expression allée: allée lined with gambel oak and native shrubs.
Topography on the western site boundary provides a degree of enclosure for the overall site and is reinforced by masses of gambel oak, sagebrush, and rabbitbrush. The topography gently leads the eye along the plane of the ground, which is planted with native forbs and grasses, and eventually to berms that provide a visual and aural barrier. These berms screen the motion and noise of the I-15 corridor, while plant masses provide vertical structure.

The ponds on the eastern edge of the site serve as another primary boundary. The ponds are lined by dense plantings of native willow, cottonwood, shrubs, sedges, rushes and water-adapted grasses and forbs. These transitional plant communities provide

Figure 29. Artistic restoration design expression vegetation and cues for human use: diverse native plant communities provide structure for wildlife habitat and improve water quality of ponds by filtering sediment and pollutants. Informal paths and seating provide areas for human use.
critical wetland habitat for a host of species, and improve water quality in the ponds by filtering sediment and contaminants.

**Movement/Paths.** This design embodies two distinct concepts: First, a formal allée provides users with an efficient and engaging route that leads them through the site. Second, supplementary paths that gently meander through the site allow users an informal way to experience the site (Figures 29 and 30). These paths run adjacent to the mounded wooded area on the western edge of the site. The traditional axial design element as the primary network of circulation provides structure and clarity to areas that could otherwise be perceived as chaotic. Meandering paths encourage the user to slow down and experience the place (Figure 29) with the inclusion of benches and viewing areas.

*Figure 30. Artistic restoration design expression secondary path: the gently meandering path invites users to participate within the landscape and experience regional uniqueness.*
The surface materials used to construct the axial paths in this design expression are native rock, cut in geometric shapes to satisfy the human desire for order. The secondary, meandering paths are of fine gravel, which provides sound and tactile sensations while traveling throughout this portion of the landscape.

**Edges.** The way in which edges are planted in this design is an important distinguishing element within the restoration design approach. Edges that define the boundaries of the site are created primarily by landscape features and existing development (i.e., residential development, I-15 corridor). In this approach, vegetation is used to soften the hard or abrupt quality of these edges, while providing structure to the site’s boundaries. Within the site, edges are created by the placement of paths and vegetation. Also in this approach, native plant communities serve to separate more heavily used human-centric spaces, like the central plaza and paths, from smaller intimate areas frequented by wildlife and the occasional human observer. Plantings provide shade, wildlife habitat, and an overall increase in biodiversity. Mowed areas and benches adjacent to paths provide picnic sites to accommodate social interaction, people watching, or reading. Because these edges are composed of a diverse palate of plants that fill varied functional groups, they include habitat qualities required for wildlife use. These transitional spaces provide refuge from the sun and add a level of comfort in the perceived shelter that edges provide. Edges within the site tentatively knit adjacent spaces together with their permeable visual characteristic. As shown in Figures 26 and 27, a strong edge is formed around the central plaza and fountain by the concentric massings of surrounding trees, reinforcing this space as the landscape’s focal
area. Many of the edges created by the meandering paths are soft edges that encourage divergence from the built paths, encouraging guided movement for some users and desired freedom for others. Built paths encourage people to stay on the trails, and leave vegetated areas for wildlife use.

Because water and wetland plant species are critical elements for many wildlife species, grading and hydrologic conditions suitable to the establishment of diverse riparian vegetation communities are found along the water’s edge (Figure 31). This dense belt of vegetation provides a visual boundary for the upland portion of the site while framing the pond spaces.

Figure 31. Artistic restoration design expression pond wetland area: Diverse native vegetation communities include wetland habitat surrounding ponds, and upland habitat in the mid-ground fosters a feeling of a more natural environment.
Focus. The focus of the site is the fountain in the central plaza. The fountain provides a destination that is visible from three primary axial paths, a point for orientation, and a traditional landscape element that people understand as an integral part of the formal design approach. The fountain is a place where people gather, providing a meeting place for social interaction and an element of civilization in a native landscape.

Color, Texture, Form, Repetition. To capture the essence of desert grasslands that once prevalent within the Intermountain West, a native plants palate is used within this design expression. This palate contrasts with traditional design approaches that are often used. Greater plant diversity adds color, texture, form, and seasonal interest. This diversity in turn provides more opportunities for wildlife to thrive and fit within the historical regional context.

Plant species chosen for this expression represent the colors of the region, relating to the surrounding foothills and mountains. Desert grassland plantings provide subtle movement, refined texture, and interest as they respond to seasonal climate variations. These grassland areas also bind the site together through the repetition of color and texture.

Ecological Value Analysis

This site contains six primary habitat types: open water, riparian woodland, emergent marsh, grassland, shrubland, and shrub-scrub habitat (Figure 32). The diversity of habitats created should provide shelter and food for many wild life species.
Figure 32. Artistic restoration design expression, habitat types: Six primary habitat types are present within this design expression. These include open water, riparian woodland, emergent marsh, grassland, shrubland, and shrub-scrub habitat.
The use of native plants is a fundamental component within the restoration design expression to achieve acceptable ecological function within the site. As plants native to the Intermountain West have shared a long evolutionary history with native fauna, plants have evolved with chemical qualities that are specific to each species (Mack and Erneberg, 2002), enabling insects to recognize these native species as a food source (Tallamy, 2007). By definition, native insects have shared little or no evolutionary history with introduced (ornamental or exotic invasive) plants and is not as likely to possess the adaptations required to use those plants as nutritional hosts (Tallamy, 2004). Because animals either directly or indirectly depend on plants for their food, animal diversity in a particular habitat is very closely linked to the diversity of the plants found in that habitat (Rosenzweig, 1995). Table 7 outlines the indicators used to measure restoration success (SER, 2004) and to rate the restoration design expression. These indicators include consideration of reference ecosystems, inclusion of native species and the use of all functional groups to the greatest possible extent, sustainability of the site, functionality for stage of development, linkage to other native ecosystems, and resilience to stress.

Table 7.
SER Assessment of the Artistic Restoration Design Expression – assessment of the artistic restoration design approach as it relates to attributes used to measure restoration success as defined by SER (2004).

<table>
<thead>
<tr>
<th>Attributes used to measure restoration success</th>
<th>Artistic restoration design approach assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Contains characteristics of reference ecosystem</td>
<td>Includes components of reference ecosystem that were common before agriculture and suburban development</td>
</tr>
<tr>
<td>2) Contains native species to the greatest possible extent</td>
<td>Invasive plant species currently dominate the site. Site will require monitoring and treatment of invasive species</td>
</tr>
<tr>
<td>Attributes used to measure restoration success</td>
<td>Artistic restoration design approach assessment</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>------------------------------------------------</td>
</tr>
<tr>
<td>3) Contains all functional groups for continued development/stability</td>
<td>Planting plan includes vegetation that fills a diverse functional group, specifically, grass, forb, legume, and woody species</td>
</tr>
<tr>
<td>4) Physical environment of restored ecosystem capable of sustaining reproducing populations</td>
<td>This design approach could potentially sustain reproducing populations of plant and insects and wildlife; however, this greatly depends on the maintenance standards adopted; if plant species are allowed to go to seed and are not cut back, invasive non-native species are appropriately controlled, it is possible for reintroduced native vegetation communities to align with more natural successional processes</td>
</tr>
<tr>
<td>5) Functions normally for its ecological stage of development</td>
<td>It is anticipated that with the use of more mature species planted directly on site (rather than starting from seed), irrigation, reintroduction of a variety of species (both early and late successional), control of invasive/non-native species, the site will function at or above the ecological stage of development</td>
</tr>
<tr>
<td>6) Integrated into larger ecological matrix or landscape</td>
<td>Isolated patch of habitat. Bordered to the west by I-15, to the north and south by residential development and to the east by a secondary road and residential development regardless of design</td>
</tr>
<tr>
<td>7) Threats to integrity from surrounding landscape have been eliminated</td>
<td>Surrounded by development. Risks to restored/ created ecosystem include human use/interference, invasive species, isolated from other habitat which will reduce transfer of seeds from various native plant species and introduction of more native biodiversity</td>
</tr>
<tr>
<td>8) Resilient to endure periodic stress events</td>
<td>With the inclusion of diverse plant functional groups, the site will be more resistant to invasive plant species; resilience will improve with time and appropriate non-native invasive species management</td>
</tr>
<tr>
<td>9) Self-sustaining to the same degree of its reference ecosystem</td>
<td>Not likely to be self-sustaining to the degree of reference or similar habitats within the region; invasive species will continue to be problematic while native vegetation is establishing; due to its isolation, other, native species will have a harder time colonizing the site, limiting self-perpetuating biodiversity</td>
</tr>
</tbody>
</table>
Comparison and Discussion

Each design expression proposed in this thesis could bring unique qualities, strengths, and weaknesses based on the program, context and characteristics of ecological function as cited within and aesthetics established for each individual approach. Table 8 compares the three design expressions and rates each for contributions to aesthetic and ecological considerations and cultural value perception established by Nassauer (1995b) for “cues to care,” SER (2004), as well as design elements and principles. This study did not include a quantitative analysis or rating of the three design approaches, rather a qualitative assessment was applied. The qualitative assessment examined how individual expressions incorporated the regional ecology through the use of native plant communities and packaged these plant communities into culturally acceptable landscapes through the use of design principles. Each expression’s design components were categorized as one of the following: low, fair, moderate, high. “Low” denotes that an expression essentially did not address this design component. A “fair” rating indicates that the design component is present within the expression; however, it is not the focus of the design program. A “moderate” rating indicates that the design expression included this component within the design program, although it may not provide the maximum benefit based on the site’s potential. A “high” rating indicates that the expression maximizes the site’s potential to fulfill a particular design component.
Table 8  
*Comparisons of the Three Design Expressions – comparisons of aesthetic qualities and ecological value ratings for three design expressions.*

<table>
<thead>
<tr>
<th>Design Considerations (Dee, 2001; Booth, 1990)</th>
<th>English-Style Design Expression</th>
<th>Basic Restoration Expression</th>
<th>Artistic Restoration Design Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spatial Character</td>
<td>moderate</td>
<td>low</td>
<td>high</td>
</tr>
<tr>
<td>Circulation</td>
<td>high</td>
<td>low</td>
<td>high</td>
</tr>
<tr>
<td>Edges</td>
<td>moderate</td>
<td>moderate</td>
<td>high</td>
</tr>
<tr>
<td>Foci/Dominance</td>
<td>high</td>
<td>low</td>
<td>high</td>
</tr>
<tr>
<td>Color</td>
<td>moderate</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>Texture</td>
<td>moderate</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>Form</td>
<td>high</td>
<td>low</td>
<td>high</td>
</tr>
<tr>
<td>Repetition</td>
<td>high</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>Contrast</td>
<td>moderate</td>
<td>fair</td>
<td>moderate</td>
</tr>
<tr>
<td>Genius loci/Context</td>
<td>low</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>Rhythm</td>
<td>high</td>
<td>moderate</td>
<td>moderate</td>
</tr>
<tr>
<td>Balance</td>
<td>high</td>
<td>moderate</td>
<td>high</td>
</tr>
</tbody>
</table>

**Cues to Care (Nassauer, 1995b)**

<table>
<thead>
<tr>
<th></th>
<th>English-Style Design Expression</th>
<th>Basic Restoration Expression</th>
<th>Artistic Restoration Design Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mowing</td>
<td>high</td>
<td>low</td>
<td>moderate</td>
</tr>
<tr>
<td>Flowering Plants and Trees</td>
<td>moderate</td>
<td>moderate</td>
<td>high</td>
</tr>
<tr>
<td>Bold Patterns</td>
<td>high</td>
<td>low</td>
<td>high</td>
</tr>
<tr>
<td>Trimmed shrubs &amp; linear planting designs</td>
<td>high</td>
<td>low</td>
<td>high</td>
</tr>
<tr>
<td>Fences &amp; Architectural Detail</td>
<td>moderate</td>
<td>Low</td>
<td>moderate</td>
</tr>
<tr>
<td>Foundation Plantings</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Ecological Value (SER, 2004)**

<table>
<thead>
<tr>
<th></th>
<th>English-Style Design Expression</th>
<th>Basic Restoration Expression</th>
<th>Artistic Restoration Design Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contains reference ecosystem species</td>
<td>low</td>
<td>moderate</td>
<td>moderate</td>
</tr>
<tr>
<td>Contains native species to largest extent possible</td>
<td>low</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>Contains all functional groups</td>
<td>fair</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>Can sustain reproducing populations</td>
<td>low</td>
<td>moderate</td>
<td>moderate</td>
</tr>
</tbody>
</table>
Table 8 (continued)

<table>
<thead>
<tr>
<th>Ecological Value (SER, 2001) continued</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functions normally for stage of development</td>
</tr>
<tr>
<td>Integrated into larger ecosystem</td>
</tr>
<tr>
<td>Threats to integrity eliminated</td>
</tr>
<tr>
<td>Resilient and can endure periodic stress</td>
</tr>
<tr>
<td>Self-sustaining to the same degree as reference</td>
</tr>
</tbody>
</table>

*Note:* “Low” denotes that an expression essentially did not address design or ecological considerations. A “fair” rating indicates that the design component is present within the expression; however, it is not the focus of the design program. A “moderate” rating indicates that the design expression included this component within the design program, although it may not provide the maximum benefit based on the site’s potential. A “high” rating indicates that the expression maximizes the site’s potential to fill a particular design and/or ecological component.

The English-style and artistic restoration design expressions both rate high for quality of spatial character, circulation, foci, and detail. Both of these expressions focused on the integration of human presence within the site, which is important because this site is intended to be used and enjoyed by the public. The artistic restoration design expression also embedded ecological value within the program, adding meaning to the site’s original function and context to the human experience by including native vegetation communities. However, because of the probability of continued human use and presence, it can be argued that there will be a reduced habitat due to paths and built landscape features, which would divide, fragment, and isolate habitat within the site. Thus, the artistic restoration design expression was rated moderate for ecological
function. The English-style expression rated fair in the level of detail or biodiversity and ecological function. Although this expression is characterized by reduced biodiversity, use of introduced ornamentals, and a requirement for high-energy inputs, a fair rating was assigned based on the idea that this space still provides open space, allowing for basic ecosystem services such as water infiltration. The level of detail is regarded as fair due to the reduction in biodiversity. The artistic restoration design expression was rated high for flowering trees and shrubs while the traditional and restoration designs were rated moderate. This rating is due to the increased biodiversity paired with the density of planting that can be successfully achieved with denser massing of species and supplemental irrigation.

The basic restoration design expression does not include elements encouraging human use and was rated as either none or fair for space, movement/paths, edges, and foci. However, this expression rated high for detail and ecological value contained within the program. Significant detail comes from the biodiversity found on-site as well as the natural evolution that the site is allowed to experience because of the reduction of human interference. The ecological value component rated higher than the artistic restoration design expression because of the increased continuity of vegetation communities and the intent to return the site to a more natural successional trajectory.

The design and ecological elements and respective ratings listed in the comparison table (Table 8) were based upon qualitative descriptions and/or distinctions, rather than a quantitative analysis that could be measured numerically. As such, there is a level of bias based on the academic and professional experience of the rater which would favor a combination of aesthetics and restorative design. However, based upon the
literature reviewed and expected maintenance standards of each landscape design, the ratings do point to the artistic restoration design approach that would fulfill broader needs for human use, regional ecological relevance of plant communities, environmental contributions through improved biodiversity, and less environmental costs through reduced need of outside energy and maintenance inputs.

Despite the limitations of the rating system employed, this comparative analysis provides a format that allows landscape designers to identify key elements to foster cultural acceptance and ecological function through design considerations. The comparison table is a relatively quick assessment that can help guide design decisions and identify potential weaknesses from the characteristics of the various approaches. The comparison analysis from Table 8 can also be used to guide design and restoration approaches and identify where more quantitative research could further justification of making the artistic restoration design approach a landscape design industry standard.
CHAPTER VI
DISCUSSION AND CONCLUSION

The development of a built landscape invariably alters a site’s ecology. For centuries, landscape designers have expressed cultural values of their time with limited concern for impacts their designs might have on the environment in which they lived and worked. As with Andrew Jackson Downing and later Fredrick Law Olmstead, landscape architects have begun to be more aware of the ecological context for their work. A continuous, though frequently sidetracked, march toward designing more natural and sustainable landscapes is happening. In the early to mid-20th Century, Jens Jensen pioneered the use of native plants. Ian McHarg and many since have pushed to incorporate ecological considerations into design, in part due to the value a healthy ecosystem provides to society. These ecosystem services include erosion control, wildlife habitat, improved water quality, and water conservation, to name a few. The creation, restoration, and creation of native ecosystems is increasingly becoming the focus of landscape architects. However, tastemakers, the landscape industry and design professionals often sell products that reflect divergent landscape ideals. Cultural resistance is still common to landscape designs inclusive of native plant communities as they are often seen as wild and unkempt. However, the traditional and progressive approaches to landscape design need not be mutually exclusive. Reviewed research showed that the public will accept more ecologically sound design if they are skillfully conceived, include familiar cues and are properly maintained. By incorporating design
considerations as outlined by Dee (2001) and Booth (1990) in addition to integrating cues
to care (Nassauer, 1995b), landscapes that embody a moderate degree of ecological
function can be successfully designed and accepted by the public.

This study explored alternative approaches to the design and/or restoration of a
disturbed landscape on a 20-acre parcel of land on the UBC property. These alternatives
integrated varying levels of ecological function, structure, process and the inclusion of
human use through design. Based on an analysis of the region, ecological principles,
cultural design preferences and design elements and principles, three design expressions
were developed and conceptually proposed to the site: English-style (formal), basic
restoration (scientific), and an artistic restoration design. First, the English-style design
placed a priority on legibility and on accommodating human activity. The second design,
referred to as the basic restoration design expression, restored the site to a putative pre-
European settlement state. This design included native plant communities and, to the
greatest extent possible, and accommodated wildlife communities. Human use was not
encouraged by this design expression. The third design expression, called the artistic
restoration design expression, a hybrid of the English-style and the restoration designs,
focused on restoration of native plant communities in the most sensitive areas while still
accommodating a variety of human recreational activities.

Each design expression was assessed and compared using SER (2004) criteria,
cues to care as outlined by Nassauer (1995b), and the consideration of design
fundamentals to create a qualitative metric of comparison. Each expression’s design
components were categorized and rated as low, fair, moderate, or high. As one would
expect, the English-style design expression scored almost exclusively high to moderate
on design considerations and cues to care, while being rated low for ecological value. Conversely, the basic restoration approach rated well for ecological value and low for cues to care and design considerations. The final expression, the artistic restoration design, presented a more balanced approach to design, and attempted the consideration of a more holistic view of the site’s natural history and surrounding native vegetation while including important hallmarks of design that included provisions for anticipated human use. While the design did not rate as high as the basic restoration design approach on some ecological value metrics, it did provide moderate ecological value, an improvement upon the English-style approach, primarily due to the inclusion of native plant communities. The artistic design expression incorporated important elements of cues to care and considered and applied design fundamentals that were ignored in the scientific restoration design.

This thesis did not identify one design approach that was clearly superior, because the information presented was subjective and not sufficiently quantifiable, although it could be argued that the artistic restoration design approach could be widely accepted by the public while still fulfilling important ecological roles. Furthermore, the personal and cultural preferences of a given evaluator will result in different ratings for the individual expressions described here.

That said, a combined aesthetic and ecological approach, like that presented in the artistic restoration design expression, can resonate for human enjoyment, fulfill fundamental needs for human interaction with nature, and provide islands of biologically diverse landscapes for wildlife and humans to use as sanctuaries and links to other native habitats in an increasingly urbanized landscape.
The metrics used to judge the holistic value of a given landscape design will continue to evolve as landscape designers search for alternative methodologies to remedy the placeless qualities of mass-produced turf and annuals imposed on landscapes. In the Intermountain West, a broader and deeper knowledge of native plants and ecology will aid in the design of credible, satisfying habitats for human occupation. As landscape architects look to preserve landscapes with native value and restore landscapes that have been disturbed or degraded, they can turn to the principles and elements of design to bridge the gap between cultural preferences for familiar aesthetic and elements of ecological function.

This study suggests that restoration of native shrub-steppe plant communities in combination with a formal English-style design approach can be integrated through fundamental design principles to meet moderate restoration objectives while integrating, educating and accommodating humans. This is critical, because without public buy-in, (i.e. tamed restoration), few parks or residential properties will be designed and planted with native plant species and communities. Through better understanding of human preferences for less biodiversity based on old design schemes like the Picturesque (e.g. simplified plant palates) and rigorous maintenance practices (mowing, insecticide and herbicide treatments) design practitioners will begin to identify important cues that will start to change perceptions and misperceptions about an ecological approach to design.

By making ecologically responsible choices a priority, landscape architects can improve water quality, reduce erosion, sequester carbon, provide habitat for beneficial species of wildlife including pollinating insects, preserve the regional sense of place, improve individual and community health, better understand the place we live, embrace
successional and seasonal change of a landscape, and improve overall quality of life. We can express a fundamental consideration for all life, human and non-human, by reducing the use of fertilizers and chemical pest control, by planting species that have adapted through time, and that thrive in and contribute to this region. By embedding ecologically meaningful components and processes into public spaces, peripheral natural areas and our own backyards while applying design principles, one can set an example of a more balanced approach to the participation of humans and their contribution within the natural world.

There are of course limitations of this thesis. The ecological review of literature was not intended to be comprehensive for the Intermountain West region, rather an introduction to key principles that outline ecological function and an approach to identifying important landscape restoration milestones. Focus was placed on ecological elements that could be visually measured, and in turn, rated on an aesthetic scale. Further, the rating of each design expression likely contains bias. This could have been mitigated in part by opening the rating system up to community members and an interdisciplinary team of designers and ecologists and by utilizing a numeric rating system to quantify findings. Rigorous new design metrics that scientifically document environmental, social, economic and aesthetic values associated with integrated designs are needed for future work. Landscape architects, design professionals, and restoration scientists understand that integrating native ecosystems into our built landscapes is important. However, the next step is to move past theory and provide more specific and meaningful methodologies to make the artistic restoration design approach an industry standard. This thesis has helped to bridge the disparity of understanding between human
landscape preference and imbedding ecological function within a design. Landscape restoration design can be presented through design to create rich cultural and regional context, regardless of scale. Every design choice, no matter how small holds potential to contribute or detract to ecosystem function and regional aesthetic. The inherent health risks and negative ecological impacts associated with the maintenance of typical urban and suburban landscapes call for the adaptation of preferences and design practices that reset cultural preferences toward well-adapted, sustainable environments. These landscapes will be healthier for humans and other animals such as pets and wildlife with the reduced rate of applied chemicals and mechanized inputs.
REFERENCES


